MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE. Assistant Editor: HERBERT C. HUNTER.

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The MONTHLY WEATHER REVIEW is based on data from about 3500 land stations and many ocean reports from vessels taking the international simultaneous observation at Greenwich noon.

Special acknowledgment is made of the data furnished by the kindness of cooperative observers, and by R. F. Stupart, Esq., Director of the Meteorological Service of the Dominion of Canada; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Capt. I. S. Kimball, General Superintendent of the United States Life-Saving Service; Commandant Francisco S. Chaves, Director of the Meteorological Service of the Azores, Ponta Delgada, St. Michaels, Azores; W. N. Shaw, Esq., Director Meteorological Office, London; Maxwell Hall, Esq., Government Meteorologist, Kingston, Jamaica; Rev. L. Gangoiti, Director of the Meteorological Observatory of Belen College, Havana, Cuba.

As far as practicable the time of the seventy-fifth meridian is used in the text of the MONTHLY WEATHER REVIEW.

Barometric pressures, both at land stations and on ocean vessels, whether station pressures or sea-level pressures, are reduced, or assumed to be reduced, to standard gravity, as well as corrected for all instrumental peculiarities, so that they express pressure in the standard international system of measures, namely, by the height of an equivalent column of mercury at 32° Fahrenheit, under the standard force, i. e., apparent gravity at sea level and latitude 45°.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

IN GENERAL.

Central and west-central Asiatic and northern European pressures were low until the third decade of the month, when an area of high barometer appeared over the British Isles and adjacent waters and moved thence slowly eastward. From the region of the Azores over southern Europe pressure continued high. No well-defined storms of tropical origin appeared over the north Atlantic Ocean. Barometric disturbances that appeared over the United States were of moderate strength and were confined to northern districts. No severe windstorms occurred on the coasts of the United States, and destructive storms that occurred in the region of observation were of a local character. August as a whole was cool with frequent rains, except in the Northeastern and Southwestern States, where precipitation was deficient, and in the middle and south Pacific coast districts, where rain seldom occurs in August. The month opened with cool weather for the season from the Rocky Mountains to the Atlantic coast. A cool wave crost the middle and northern districts from the 12th to 14th, and on the 20th a cool wave was attended by frost in extreme northern districts from the Rocky Mountains to New England. In the middle-interior portions of the country the warmer periods were from the 5th to 11th and 28th to 31st.

BOSTON FORECAST DISTRICT.

The month was cool and dry, and in southern New England it was the driest August in many years. During the last half of the month minimum temperatures were low and light frost occurred in some sections of Maine and New Hampshire. No windstorms occurred on the coast.—*J. W. Smith, District Forecaster.*

NEW ORLEANS FORECAST DISTRICT.

The month was warm and dry, and no general storm occurred on the west Gulf coast.—*I. M. Cline, District Forecaster.*

LOUISVILLE FORECAST DISTRICT.

No important storms occurred and the temperature was about normal. Except in western Tennessee and in localities in central Kentucky and northeastern Tennessee, where there was a marked deficiency, the rainfall was about normal.—*F. J. Walz, District Forecaster.*

CHICAGO FORECAST DISTRICT.

The month presented no especially notable features. The disturbances that visited the upper Lakes, tho of slight intensity, were in a number of instances attended by thundersqualls, due notice of the occurrence of which was given shipping interests. High temperatures were experienced in the central valleys during portions of the first and third decades of the month. On the morning of the 20th light frost was reported from Montana to the Red River of the North Valley. The occurrence of frost in the region referred to was forecast the morning of the 19th.—*E. B. Garriott, Professor and District Forecaster.*

DENVER FORECAST DISTRICT.

The month was cooler than usual, except in eastern Colorado and southeastern New Mexico, with an excess of rainfall in northern Arizona, New Mexico, western Colorado, and northern Utah. In southeastern Wyoming and eastern Colorado the rainfall was light. Frosts were confined to high-level stations.—*F. H. Brandenburg, District Forecaster.*

SAN FRANCISCO FORECAST DISTRICT.

August presented no unusual features. The month opened with thundershowers in the high Sierra and a trace of rain in the San Joaquin Valley. On the 24th, 26th, and 31st there were light showers in Nevada. No special warnings were issued.—*A. G. McAdie, Professor and District Forecaster.*

PORTLAND, OREG., FORECAST DISTRICT.

August was, as usual, a quiet month and special warnings were not required. There was a marked excess of rainfall that was most pronounced along the western slope of the Rocky Mountains. The temperature was generally below the normal.—*E. A. Beals, District Forecaster.*

RIVERS AND FLOODS.

River matters were quiet and uneventful during the month. No floods or high waters occurred, and as a rule the lowest stages were recorded during the closing days of the month.

The highest and lowest water, mean stage, and monthly range at 206 river stations are given in Table VI. Hydrographs for typical points on seven principal rivers are shown on Chart I. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Professor of Meteorology.*

SPECIAL ARTICLES, NOTES, AND EXTRACTS.

INFLUENCE OF TEMPERATURE AND MOISTURE UPON THE RATE OF GROWTH OF TOBACCO.

By George N. Coffey. Dated Washington, D. C., August 28, 1907.

The Bureau of Soils of the United States Department of Agriculture for several years conducted experiments with tobacco under shade at Tarriffville, Conn. A recent bulletin of this Bureau, No. 39, entitled "Effect of Shading on Soil Conditions", gives the results of some observations which were made during the year 1905. The temperature and relative humidity of the air, the amount of rainfall, the moisture content of the soil and the height of a number of plants were determined daily. All of these observations, except rainfall, were made both inside and outside of the tent.

These observations showed that the effect of the tent is to conserve the moisture in the soil, to increase the temperature and relative humidity of the air, to reduce the velocity of the wind, to make a taller, larger, more rapid, and earlier growth of the plant, but to diminish the yield per acre by from 100 to 300 pounds; thus showing that the leaves were thinner or had a more delicate texture when grown under shade than when grown outside the tent.

Table 1, compiled from data taken inside one of the tents, shows the mean temperature and relative humidity of the air, the moisture content relative to saturation of the first 9 inches of the soil, the average height of the plants, the average amount of growth, and the average percentage of growth for five plants. These percentages represent the ratio of the daily growth divided by the average height on the earlier date. While the plants were small the measurements were taken to fractions of an inch, but later the fractions were omitted.

Table 1.—*Measurements of tobacco plants and conditions surrounding them; mean temperature, relative humidity, and soil moisture in the shade of the tent.*

Date.	Mean temperature.	Relative humidity.	Moisture in soil.	Average height of five plants.	Average daily amount of growth of plants.	Average daily percentage of growth.
1905.	°F.	*Per cent.*	*Per cent.*	*Inches.*	*Inches.*	*Per cent.*
June 15	73.5	....	16.5	1.62	0.38	23.5
16	75.0	....	16.2	2.00	0.4	20.0
17	77.0	....	16.2	2.4	9.7	29.1
18	75.0	....	15.4	3.1	0.65	20.9
19	58.5	....	14.9	3.75	0.45	12.0
20	60.5	....	15.4	4.2	0.45	10.7
21	67.0	....	15.5	4.65	0.4	8.6
22	76.5	....	17.1	5.05	1.05	20.8
23	73.5	78.0	16.5	6.1	1.1	18.0
24	64.0	70.0	15.8	7.2		
25	74.5	75.0	16.4	....	0.97	13.5
26	71.0	74.0	15.3	....		
27	61.0	73.0	15.5	10.1	0.55	5.4
28	65.5	73.0	14.8	10.65	1.35	12.8
29	67.5	70.5	15.3	12.00	1.1	9.2
30	74.5	70.0	13.7	13.1	1.0	7.6
July 1	72.0	79.0	15.6	14.1	1.5	10.6
2	68.0	85.5	15.4	....		
3	75.0	71.0	15.3	17.1	1.7	9.9
4	74.5	70.0	14.9	18.8	2.6	13.8
5	75.0	75.0	13.5	21.4	2.2	10.3
6	79.0	76.0	13.9	23.6	1.6	6.8
7	79.0	76.0	14.0	25.2	3.4	13.4
8	82.0	76.5	13.1	28.6	2.5	8.9
9	81.0	72.5	13.0	....		
10	80.0	74.5	12.7	33.6	3.2	9.8
11	82.5	76.0	13.7	36.8	4.0	10.8
12	84.0	75.0	13.4	40.8	3.2	7.8
13	81.0	72.0	12.4	44.0	3.5	8.0
14	79.5	70.5	11.8	....		
15	68.0	71.0	13.9	51.0	3.3	6.5
16	77.0	68.5	13.9	....		
17	83.0	76.5	14.1	57.6	4.2	7.3
18	83.0	71.0	13.8	61.8	4.6	7.4
19	79.5	75.0	13.5	66.4	3.2	4.8
20	72.0	71.5	13.4	69.6	3.2	4.6
21	67.0	71.0	13.4	72.8	3.2	4.4
22	70.0	72.0	13.4	76.0	....	....

While there are several unfortunate breaks in the record it furnishes some interesting data for a study of the cause of the variation in the growth of the plants from day to day. This variation can be determined by subtracting the height of the plant one day from that on the following day. After the first of July the measurements of the individual plants were not made closer than 1 inch, and this may account for some irregularities in the growth of the plants which are difficult otherwise to explain.

There are a number of factors which may influence the rate of growth of the plant, some of which do not appear in the data given in the bulletin above quoted. Among these may be mentioned the temperature of the soil, and the amount of sunshine, two factors which certainly have an important influence. The factors which were studied in the present case were the temperature and the relative humidity of the air, and the percentage of moisture in the soil.

TEMPERATURE OF THE AIR.

From a study of the data here given it appears that in this case the variation in the temperature had a marked effect upon the growth of the plant. Fig. 1 is a diagram which shows this in a graphic way.

The solid line represents the mean temperature, while the dotted line shows the amount of growth in inches from day to day as obtained from the average of the five plants. Where only the total growth for two or more days is known the daily average is indicated by a single dot in the center of the gap, the total amount of growth being divided by the proper number. From June 15 to 24 the growth follows in a rather marked degree the changes in the temperature, increasing with the rise and decreasing with the fall in temperature. The influence of the high temperature on the 17th and 18th of July is also quite evident, the plants showing a marked increase in growth with the rapid rise of the temperature. There are, however, several important divergencies in the two lines, the most striking being on June 29 and 30 and July 6. In general it may be said that the variation was greater during the middle period of the observations. It should be added that another set of five plants grown under shade and also a third set grown outside the tent did not show such an irregularity, and it may be possible that there was some mistake in the measurements or some variation in the time of making them that would account for this.

It will be seen from the diagram that the absolute amount of growth of the plants increases as the plants become larger, whereas the percentage of growth becomes smaller, so a comparison based upon the percentage of growth rather than on the amount is in some respects more satisfactory. The measurements during the first period of observation were taken to fractions of an inch, and here the relation between the percentage of growth and the temperature is most marked.

In general the percentage of growth followed the temperature. The influence of a marked drop in temperature is always shown by a decrease in the growth of the plant and this appears to affect the plant for several days afterwards. Take, for example, the decided drop in temperature from the 18th to the 19th of June, when there was a fall of 16.5° in the mean temperature from one day to the next. The percentage of growth of the plants decreased. From the 19th to the 20th there was a rise of 2° in the mean temperature, but a further decrease, tho slight, in the percentage of growth. Likewise from the 20th to the 21st the mean temperature rose 6.5°, but the rate of growth was slightly less than on the preceding day. From the 21st to the 22d there was a further rise of 9.5° and the growth increased 12.2 per cent. Thus it would seem that it took the plants two days to recover from the effect of the marked drop in temperature on the 19th. When, however, they had recovered they leapt up with a bound under the marked rise in temperature which had taken place. With the temperature at its former level the percentage of growth also became practically the same.

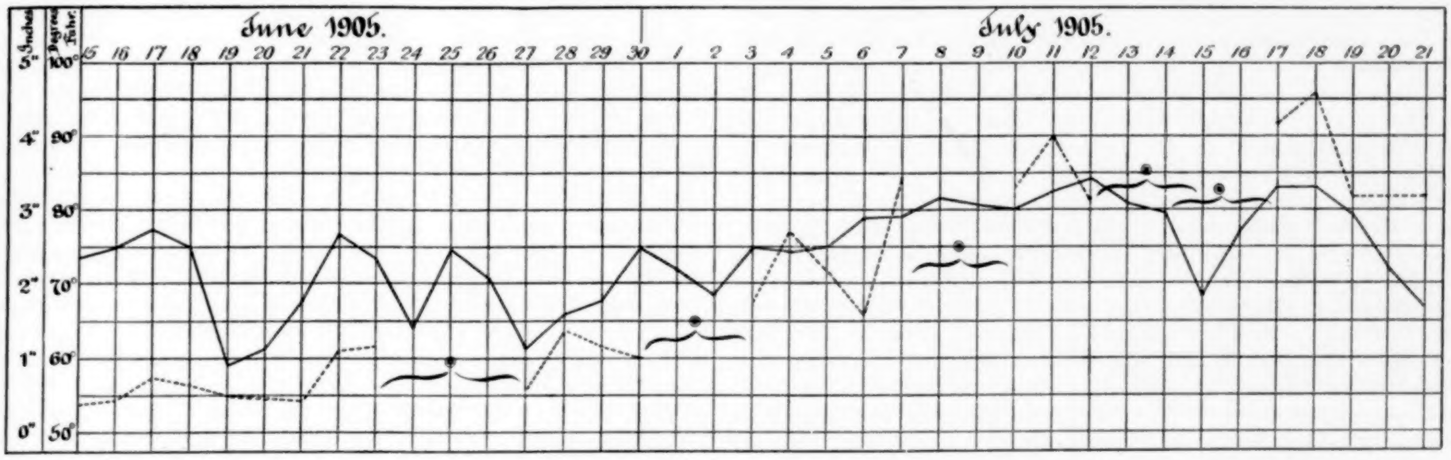

Fig. 1.—Daily temperatures and growth of tobacco plants. Solid line, observed mean daily temperature, Fahrenheit. Dotted line, observed average daily growth of five plants, in inches.

In order to show more definitely the influence of temperature upon the growth of the plants it will be best to compare the percentage of growth on the days with highest and lowest temperatures. Since the percentage of growth decreases so much and the amount of growth increases so much as the plants become larger, it will be well to divide the observations into three shorter periods, roughly where there are breaks in the daily observations. In the first place we will compare the mean percentages of growth on days falling in different classes as to temperature:

Days with mean temperature—	First period, June 15–23.		Second period, June 27–30, July 3–7.		Third period, July 11, 12, 17–21.	
	Number of days.	Mean rate of growth.	Number of days.	Mean rate of growth.	Number of days.	Mean rate of growth.
°		Per cent.		Per cent.		Per cent.
80 or higher	0	....	0	....	4	8.6
70–79.9	6	22.0	6	10.3	2	4.7
60–69.9	2	9.6	3	9.1	1	4.4
Lower than 60	1	12.0	0	....	0	....

In this table in the second period the 1st and 2d of July were omitted, as were also the 13th, 14th, 15th, and 16th of July in the third period, owing to the omissions in the original records.

In every instance the mean percentage of growth decreases, except for the day when the temperature was lower than 60°; this occurred on only one day (June 19), altho the following day the mean temperature was only 60.5°. Probably the effect of the marked drop in temperature on the 19th was not fully felt until next day.

The following table shows the percentages of growth during the hottest and the coolest day of each period:

	First period.	Second period.	Third period.
	Per cent.	Per cent.	Per cent.
Hottest day	29.1	10.1	7.8
Coolest day	12.0	5.4	4.4

This table indicates very plainly the marked effect of the temperature. In the second period there were two hottest days which had the same mean temperature, and the figure given is the mean of these two days. While there is a considerable difference in the growth on these days (July 6 and 7) both were higher than that of the coolest day.

Another method of comparison is by taking the mean of the three hottest and three coolest days of each period, and this is shown in the following table:

	First period.		Second period.		Third period.	
	Mean temp.	Mean rate of growth.	Mean temp.	Mean rate of growth.	Mean temp.	Mean rate of growth.
	°	Per cent.	°	Per cent.	°	Per cent.
3 hottest days	76	23.3	78	10.1	83	7.5
3 coolest days	62	10.4	64	9.1	72	4.6

Here, as in the above tables, there is a decrease in growth with a fall in temperature.

The mean percentage of growth for all days with a temperature less than the mean temperature (73.8°) of the entire period (exclusive of those days upon which no observations were taken) is 10.8, while that for the days with a greater mean temperature is 12.5. The mean temperature of the former days is 66.6°, while that of the latter is 79.3°. A difference of 11.7° in temperature has therefore produced a difference of 1.7 per cent of growth, or 0.145 per cent of growth for each degree change in temperature.

HUMIDITY OF THE AIR.

In this connection we will now make a comparison of the percentage of growth with the relative humidity of the air. The following table shows for the second and third periods the mean percentage of growth on the three days having respectively the highest and the lowest relative humidities. The first period will have to be omitted, as the humidity was not then determined.

Mean percentage of growth on three days of—	Second period.	Third period.
	Per cent.	Per cent.
Highest humidity	10.2	7.6
Lowest humidity	10.2	5.5

In the second period it would appear that the relative humidity had no influence whatever upon the growth. The third period, however, seems to indicate that a high humidity is more favorable to the rapid growth of the plant.

If we consider the growth on the days having a humidity below the mean (73.9 per cent) for the two periods, we find that the percentage stands 8.9 for the days with a higher humidity and 8.3 for those having a lower. This is a very small difference, but would seem to indicate that a high humidity is slightly more favorable for rapid development of the plant. It should be noted, however, that the days with the greatest humidity were more often also days of high temperature, and it does not seem improbable that the slight difference shown above is due to this factor instead of to the greater humidity.

In this connection a comparison of the percentage of growth on days having the same temperature but different humidity with that for other days on which the conditions were reversed will be especially instructive. Let us take for example the 3d and 5th and 17th and 18th of July. The mean percentage of growth on the 3d and 18th, the days having relatively the lower humidity, was 8.6 per cent, while the 5th and 17th showed only 8.8 per cent. This comparison would seem to show that the greater humidity produced the greater growth, but the very reverse would have been found if we had taken the 4th instead of the 3d. On the 27th and 28th of June the humidity was the same, while the temperature was different, and this is practically true for the 29th and 30th of June and also the 20th and 21st of July. For the first two days the growth was greater on the day of higher temperature; for the second two days the reverse is found, while the third pair is similar to the first. The mean for the three days of relatively lowest temperature is 6.3 per cent, while for the three highest it is 8.3 per cent. This would indicate that the temperature is the most important factor in determining the rate of growth.

MOISTURE OF THE SOIL.

The following table shows the mean percentage of growth on the three days with greatest and least moisture content of the soil:

Mean percentage of growth on three days of—	First period.	Second period.	Third period.
	Per cent.	*Per cent.*	*Per cent.*
Greatest moisture	20.5	8.2	8.5
Least moisture	14.5	8.2	8.6

The figures for the first period would seem to indicate that the greater moisture content was decidedly more favorable, but it should be noted that the days with lowest moisture content coincided with days of extremely low temperature, which doubtless accounts for the marked difference of growth. The other two periods show practically no difference in growth, and we seem justified in concluding that the variation in moisture here had no influence in determining the rate of growth. However, the moisture never fell lower than 11.8 per cent, and this quantity was doubtless sufficient for the needs of the tobacco plants under existing conditions as to sunshine, temperature, and wind; so that much greater changes in the moisture content must be made before its influence can be determined.

SUMMARY.

To sum up: The data would indicate that the moisture in the soil was always sufficient in quantity, and that the relative humidity of the air had very little if any influence upon the rate of growth, but that a decided rise or fall in temperature was followed by an acceleration or diminution, respectively, in the rate of growth of the plants. When, however, the change in temperature was small there were other unknown factors that had a more important influence. If the measurements had been taken to one-sixteenth of an inch, a closer relation might have been shown here also.

STUDIES OF FROST AND ICE CRYSTALS.

By WILSON A. BENTLEY. Dated Jericho, Vt., May 28, 1906. Revised July, 1907.

PREFACE.

(1) Object of this memoir.

This paper is intended as a companion memoir to my "Studies among the snow crystals during the winter of 1901–2", etc., published by the Weather Bureau in 1902.[1] It is my hope that the present study may serve to reveal the forms, structure, life history, and general relations of the frost and ice crystals even more fully than did the memoir on snow crystals.

The forms that occur among the frost, ice, hoarfrost, window-frost, and window-ice crystallizations are hardly less beautiful, varied, and interesting than are those other marvelously beautiful crystals from cloudland that we call snow. The great beauty and diversity of the frost and ice crystals early attracted the author's attention and study, and his first photomicrographic work, while he was yet in his "teens", was directed to this subject. He secured his first photomicrographs of frost crystals in December, 1884. This work has been continued by him, mostly at his home in Jericho, Vt.,[2] at intervals ever since. A few, and sometimes many, forms were photographed each winter, so that now his collection numbers over seven hundred specimens, of which no two are alike.

His endeavor has been not only to learn all possible regarding their manner of formation, habits of growth, and the conditions under which various varieties form and develop, but also to secure a fairly complete series of photographs that should preserve for the student the semblance of each and every type and species of crystal of frost and ice. This has proved to be a task of no small difficulty, requiring a vast amount of time and necessitating no little expense. Some types of frost and ice proved to be very difficult subjects for photography, and in some cases it became necessary to construct special apparatus in order to secure satisfactory photographs. All the half-tone reproductions are made from original photographs of natural crystals. In this connection it is perhaps well to state that the author's photographic work on both snow and frost crystals has been carried on entirely at his own personal expense, and, as is commonly the case when investigations must be conducted solely at private expense, a lack of means has greatly hampered the work. This must be his apology for a lack of excellence in the technique of some of the photographs. Many of them could have been greatly improved by recopying.

The author hopes that this memoir will not only impart to others the knowledge that he has gained, but will call the attention of all lovers of nature to this hitherto much neglected, yet most beautiful, subject. The publication at this time, with the half-tone pictures here reproduced[3], is due to the kindly appreciation of the Chief of the Weather Bureau and the Editor of the MONTHLY WEATHER REVIEW.

It need hardly be said that the half-tones, numerous tho they be, illustrate only a few of the almost infinitely varied individual forms of the frost and ice that occur in nature. They will but give a glimpse into the beauties of this fairy realm of snow, frost, and ice.

In view of the ease with which many varieties of frost and ice crystals can be obtained it is thought best to give a brief sketch of the methods that were, or that may be, employed, in securing photographs of such objects, in the hope that this information may be helpful to many.

(2) Methods employed.

Two distinct methods may be employed in this photographic work—one by oblique light and low magnifying powers, using an ordinary one-fourth size portrait lens or similar objective and extension camera; the other by direct transmitted light, using a three-fourths or one-half inch microscope objective, for higher magnification (15 to 30 diameters.) The great majority of the window-frost, and many window-ice crystals are perhaps best secured by the former oblique-light process. Many of the large feathery window designs require no extension camera; an ordinary view camera suffices equally well.

[1] See Monthly Weather Review, Annual Summary, 1902, Vol. XXX, p. 607–616 and Plates I–XXII.

[2] On a farm 16 miles east-northeast of Burlington, midway between Mount Mansfield and Camels Hump, 1500 feet above sea level—latitude 44° 30′ north, longitude 73° 00′ west.

[3] The half-tones illustrating this memoir will be published later.—EDITOR.

These are often of such large size as to require reduction, rather than magnification; the greater number, however, require magnifying from 4 to 8 diameters. This can be obtained with a one-fourth size portrait or rectilinear lens and an extension camera, capable of being extended about 44 inches. A simple, rigid, inexpensive, home-made extension, containing the lens coupled to an ordinary view camera, answers admirably in most cases.

Photographing by this method is done indoors; the camera is placed facing the window containing the frost or window-ice designs, and a black background, varying in size and distance from the window with the magnification employed, from 25 inches square to 45 by 60 inches, is placed out of doors directly in front, and at some distance 3 to 10 feet away from the object to be photographed. The size of the background and the distance from the window varies with the magnification used; the larger the lens and the less the magnification so much the larger must the background be and the farther away from the object, and vice versa. It is best to focus by using full aperture of lens, but to use a very small stop, one-seventh inch, while exposing the plate.

The methods used in securing more highly magnified pictures were as follows: A short brass tube containing a society screw at one end, and sliding by rack and pinion within another larger tube, was fitted with a collar (at a total cost of but $6) which was fastened in an extra front board to a view camera, as a substitute for an ordinary camera lens.

A microscope objective was screwed into the society screw at the end of the brass tube. The view camera was mounted upon a board, which in turn was mounted upon slats nailed horizontally across the window casings; the board supporting the camera was fitted with grooves and arranged so as to slide horizontally across and parallel to the windowpanes; a stop or diaphragm one-fourth of an inch in diameter, corresponding to that on the microscope, was mounted outside of the window, on adjustable sliding supports, capable of both vertical and horizontal movements; this was placed about one-half an inch from the windowpane, as a nearer approach causes melting. The tin cover of a pail, 6 inches in diameter, perforated in the center and blackened, served for the diaphragm. The centering was accomplished by removing the ground glass of the camera, placing the eye at the center of its frame, and sliding (or having someone outside slide) the diaphragm until the white spot representing the diaphragm appeared at the center of the microscope objective. After focusing, a large sheet of black paper was placed between the microscope objective and the window frost, so as to exclude the light while removing and drawing the slides. Such an apparatus would, of course, not be serviceable in a city on account of the tremors due to traffic, but in the country, where the inmates of the house can be kept quiet, it serves admirably.

I.—FROST CRYSTALS IN GENERAL.

(3) General atmospheric conditions under which hoarfrost crystals form.

True hoarfrost crystals are formed directly from the tiny invisible water molecules held by heat or motion in solution within the atmosphere. Any process or condition, such as evaporation, radiation, or darkness, that tends to stop or retard the various motions of the molecules of water within the air, or to chill the objects or surfaces with which these water particles come into contact, favors frost formation. Except for the absence of clouds, and the presence of a support to rest upon, frost crystals form in much the same manner as do snow crystals. At the beginning groups of water vapor molecules are drawn to or collide with, and, as crystals of ice, attach themselves to some cold chilled object or substance, either of their own making (as in the case of the snow crystals in air and ice crystals in water), or, as is most commonly the case during frost formation, upon some foreign object or surface, either mineral or vegetable. Thence forward growth takes place because the icy crystalline nuclei draw to themselves such water molecules as may float into their immediate vicinity. The immediate source from which the vapor of water is drawn to build them up of course varies in different cases. Hoarfrost crystals form in the open, e. g., on grass blades, fences, shrubs, etc., only on cold, calm, clear nights, and draw their supplies directly from the free air close about them, but ultimately from the soil, as well as from unknown distant sources. Hoarfrost formed within confined situations, as on windowpanes, cavities within the snow, etc., draws its moisture from supplies near at hand, as from that supplied thru evaporation, steaming kettles, or exhaled in the breath of animals, etc. In general, hoarfrost forms in a calm, quiet, cloudless atmosphere, and only when the air near by is so cooled as to be supersaturated for a given temperature.

(4) The nuclei and surfaces on which frost forms.

When conditions are suitable frost forms on a great variety of objects and surfaces that lie upon or near the surface of the ground. In autumn, winter, and spring hoarfrost collects on all forms of vegetation, and on such objects as boards, fallen twigs, pieces of metal, stones, etc. It collects both on evaporative and nonevaporative objects and surfaces, tho perhaps in greater quantity upon the former. In winter it collects indoors on windowpanes and sometimes on doors; outdoors it forms within cavities in the snow and within other inclosed compartments, as also in the open on the surface of the snow, ice, shrubs, fences, etc., and more rarely on the trees within valleys or on plains, or on those growing on the hilltops. The clouds in winter often deposit some of their moisture in the form of long slender needles of frost, and this often collects in quasi crystalline or granular form on the trees on mountain tops, even when winds are blowing. It always extends downward on the mountain slopes just as low but no lower than did the cloud stratum that deposited it; hence it can always be distinguished from snow, because a well-defined, straight, horizontal line of demarkation extends across a mountain and bounds the upper region, wherein frost exists, from the region below, wherein it is absent.

(5) Form of crystals as affected by their environment and nuclei.

With the possible exception of certain plant leaves and flowers, and the excreta of certain animals, the objects upon which hoarfrost forms seem not to determine or affect the form and structure of the frost crystals. But the position and environment of those same objects, and especially their location as regards the bare earth, i. e., whether they lie close to or directly upon it, or somewhat removed and isolated from it, does in some cases seem directly or indirectly and to a large degree to affect and control their form and structure. That this is so is proved by the fact that frequently the frost crystals that collect close to the earth, and on the under sides of objects lying in direct contact with the bare ground, are of an opposite type from those that form elsewhere. In general, the great majority of the frost crystals that form over wide areas during a given night are of but one type, i. e., either columnar or tabular. The fact that one type (columnar type) of crystals almost invariably forms over large areas whenever the temperature at nightfall is so high that tiny dewdrops form previous to the formation of frost, and the fact that the other or opposite type (tabular) forms over areas equally large whenever the temperature at nightfall is so low that true frost crystals come first in the order of formation, would seem to be strong proof that the form and nature of the nuclei may be the controlling factor in form determination. The additional fact that columnar hoarfrost is the prevailing type during the so-called destructive frosts in early autumn and late spring, when dew forms during a given

night, previous to the frost, and that tabular frost is the prevailing type in the winter, when no dew forms previously, gives additional support to the hypothesis that in general columnar hoarfrost forms upon and around tiny rounded liquid or frozen dew nuclei, and tabular hoarfrost directly upon the dry nuclei furnished by the foreign objects and substances upon which it collects.

The influence that position and environment exert on the forms and structure of frost crystals is shown in many cases, especially in the case of frost formed in confined situations, as within buildings, on the walls of cavities in snow extending around or below the objects of wood, etc., embedded therein, and perhaps leading down to moist earth or water, or in the case of those that form upon the walls and ceilings of barns, cellars, water tanks, etc. In all, or most all, of these cases frost crystals form either in a very moist atmosphere, or in one that is slowly but steadily receiving fresh supplies of moisture thru evaporation, etc., and many of them form and grow in a manner markedly different from those that form and grow in the open.

The influence that position and environment exert upon frost crystals is still further shown in the case of hoarfrost crystals that form on bare compact earth (soil), or directly on the surface of ice, and lie flat on these surfaces, as contrasted with those that form on but grow upward from those same substances. In the former case the frost crystals almost invariably grow in the form of long slender columns, but in the latter case, in a branchy, tabular manner. Frost crystals that form in a strong but moist current of air, as in small cracks or apertures thru which air circulates between two compartments, are apt to grow in a more or less amorphous manner. So are those that form upon trees crowning mountain tops. Physicists and crystallographers have learned that crystals in general, when not hampered in their habits of growth by position and environment, tend to grow in a more or less solid or branch-like manner, according as they grow slowly or rapidly, and in a relatively tenuous, nonviscous or dense, viscous solvent.[4] The writer's own observations and studies have led him, however, to the belief that crystals sometimes tend to grow differently, one from another, even under the same identical conditions, positions, environments, etc.; hence he would add that mysterious something that is called individuality to the other factors that determine the form and habits of growth.

(6) Internal structure of frost crystals.

The internal structure of frost crystals varies from one type to another, and to some extent even among those of the same type. Some are completely solid, so that the lines and shadings due to excluded air are absent. Others are of a loose, fibrous, or amorphous nature. However, the great majority of the tabular frost crystals, and certain subtypes among the columnar crystals, possess a structure practically identical with that of the snow crystals. Lines and shadings due to included air are found within them. In many cases the aspect, form, position, and general arrangement of the features due to included air correspond so closely to those that occur with snow crystals that there can be but small doubt that both frost and snow crystals have been due to the same or similar causes. With rare exceptions, however, the markings that occur within the frost crystals lack the beautiful and perfectly symmetrical manner of arrangement of those found within the snow crystals. Microscopic observation of natural frost crystals while growing in natural positions would doubtless reveal the precise manner in which the air-tubes, shadings, and all interior figures are formed. Direct microscopic observation of growing frost crystals is a task of no little difficulty; it can not be carried on continuously for any length of time, because the natural heat of the body disturbs the equilibrium of the air around the growing crystals, and causes them to cease their growth.

(7) Habits of growth of frost crystals.

The habits of growth of the crystals of each mineral species are of great interest, but those of the snow, frost, and ice crystals are perhaps the most interesting and instructive of any. The molecules of water, of which these crystals are constructed, have a wonderful freedom and facility of motion among themselves in the free air while arranging themselves in crystalline forms. No dense magma or solution, no state of excessive pressure hampers or prevents their arranging themselves in a perfectly free and natural manner, in harmony with the system of crystallization to which they belong. For this reason, and because they form under such a multiplicity of conditions, it is perhaps hardly to be wondered at that they assume such varied and beautiful forms. And yet we can but marvel why on given dates and seemingly under like conditions as to temperature and pressure the individual crystals should assume such diversified forms. This diversity of form is, however, the most prominent and universal characteristic of ice crystals of whatever species. The student commonly finds frost crystals of two or more different types formed and growing within the same cavity or upon the same pane of glass, and different types of ice crystals growing in the same body of water. Frost crystals in general form and grow in one of four types, i. e., in the form of a solid hexagonal column, in the form of a hollow hexagonal column, in the form of a hollow hexagonal funnel, or as thin tabular planes.

Owing no doubt to changes in the humidity of the air, and to corresponding changes in their rates of growth, many frost and ice crystals eventually undergo a radical change or reversal in their habits of growth, and cease to grow on the plan imposed by the original nucleus. In such cases they may resume, continue, and complete their growth in an entirely different manner from that characterizing the nucleus and basal portion. Many curious and interesting compound crystals result from this cause, as will be described hereafter in detail. Under such influences hollow columns form and grow upon the apices of solid columns; hollow, funnel-like additions grow outward from hollow columns; branch-like additions upon solid tabular crystals, etc.

Altho corresponding types are markedly similar in many regards, yet differences often exist in the dimensions of snow and frost crystals, respectively. The latter rest upon a support, and hence often grow for a much longer time and attain to a larger size than do the former. Furthermore, certain types of frost seem not to have corresponding prototypes among the snow crystals. As examples, see the frost that grows in the form of hollow hexagonal funnels or in the form of longitudinal bisected segments of hollow cylinders and funnels. Singularly enough, the compound form of snow crystal called "doublet" or the "cuff-button type" seems to have no prototype whatever among the frost crystals.

(8) The growth of frost crystals compared with snow crystals.

Were the frost crystals as free to grow and develop uniformly in all directions as are the snow crystals, they would doubtless assume forms equally beautiful, symmetrical, and complex. But environment and position, the character and the inequalities of the surfaces of the objects upon which they form, operate to prevent or impair perfect or symmetrical growth in all directions. For this reason many types of frost, especially the more beautiful tabular ones, necessarily develop largely or wholly either in the segmental form or on imperfect and more or less irregular plans. Were it not for this the resemblance of each type to the corresponding type of snow

[4] I am indebted to Prof. J. P. Iddings, University of Chicago, for kindly placing this information at my disposal. His most valuable and interesting book, entitled "Rock-making Minerals", treats at some length of the forms of crystals as formed in magmas and solvents of varying degrees of viscosity.—*W. A. B.*

crystals would be still more marked. When comparison is made between types of frost and snow, segments rather than whole crystals should be used for comparative purposes.

When this method of comparison by segments is employed then the many striking points both of similarity and of dissimilarity that exist between them are well brought out. Tho many types of frost grow largely in segmented form only, some few types grow in a complete and symmetrical manner. Solid and hollow columnar frost crystals and funnel-shaped ones are examples in point. It is of great interest to note that crystals of these respective types correspond as regards perfection of form with similar columnar snow crystals.

(9) General ideas as to forms and classification of frost and ice crystals.

The individual crystals of both hoarfrost and window-frost and also, tho in lesser degree, those of ice, assume a diversity of form and structure that is seemingly infinite; hence a complete grouping and classification of them all can not be undertaken as yet. Many, however, are found crystallized in special situations or upon special objects; others possess in general some one or more common characteristic; others are formed under certain temperatures and humidities. These or other conditions have served to impress in greater or less degree certain features and peculiarities of form or structure that serve to distinguish them. These considerations make it possible to roughly group the crystals possessing similar characteristics into types by themselves. The number of distinct types both of hoarfrost and window-frost crystals is quite considerable, and hence it becomes necessary to adopt some name or symbol to apply to each type so that it may be easy to identify each in a photograph or in nature. It has been thought best to adopt some form of "mnemonic" system adapted to our scheme of classification.

(10) System of classification and mnemonics.

The words descriptive of our types may be conveniently condensed so that we may designate our various types by the several letters of the alphabet. In applying this system the first letter to be used will be the initial letter of the word that indicates the kind of frost or place of deposition, whether hoarfrost (H), window-frost (W), window-ice (I), massive ice (M), or hailstone (S). The second letter will be the initial letter of the word designating the form characteristic of the type; while the third letter will indicate the approximate relative frequency of occurrence of the type of crystal under consideration. For instance, the first letter H signifies hoarfrost, W window-frost, and I window-ice; the second letter, if it be T, signifies tabular type, if C, columnar type, etc.; while the third letter A signifies the most common type, B the next most common type, and so on down to the last letter which will denote the rarest type of all. This system will be applied to each and every group of frost and ice crystals that may hereafter be considered. Hoarfrost crystals come first under our scheme of treatment and will receive first mention. The great majority of individual hoarfrost crystals may be grouped into one or two primary classes or types, i. e., columnar or tabular. Those grouped under the former head form and develop in solid or hollow hexagonal cylindrical columns, while those grouped under the latter head develop in thin tabular planes. Tabular hoarfrost crystals are most varied both in form and structure, as there are a number of distinct subtypes that require to be presented separately.

This text is accompanied by about 275 half-tones, arranged very nearly in chronological order as shown by the List No. 1, but also rearranged by types in List No. 2. The statistics of frequency of each type are shown in Tables 1, 2, and 3. The linear magnification of the original photographs reproduced herein is approximately indicated by the small figures following the multiplication sign, ×, placed immediately after their serial numbers on the plates and in List No. 1. A reduction is shown by the use of a fraction. The published half-tones are, however, occasionally somewhat smaller than the original photographs.

II.—CLASSIFICATION OF HOARFROST CRYSTALS.

(11) Type HTA. Tabular hoarfrost.

Crystals of this type consist of solid tabular hexagons or segments thereof, superimposed in many-storied fashion, one above another.

This type of crystal is a moderately cold weather type, and occurs most frequently in late autumn, in winter, or in early spring. Crystals of this type form in autumn and spring when air temperatures at the earth's surface range from 30° to 15° F., but in winter, during intense cold, they, together with some other types, often form a hoary lining to cavities under the snow, and on the under sides of blocks of wood, etc., embedded therein. They also form in winter on the under sides of water trough covers; in similar moist situations; in the open upon the surface of the snow; upon the grass blades, shrubs, etc; more rarely upon the trees. Photograph No. 0 shows them as collected on the surface of a board, and portrays their general aspect and manner of arrangement. No. 38 C shows them as formed on and around the edges of a plant leaf, while No. 38 D shows them as arranged on a grass blade.

The present collection of half-tones from our photographs contains fifteen illustrations of this very common type of hoarfrost crystal, as follows: Nos. 0, 1, 2, 6, 9, 12, 26, 38 A, 38 B, 38 C, 38 D, 46, 118, 155, 191.

(12) Type HTB. Single solid tabular hexagons.

This type of crystal forms both in the open and within inclosed air chambers, and one variety forms indoors upon windowpanes. (See 36.) They have a general resemblance to crystals of type HTA, and often form under the same general conditions; but they differ from them in most cases in this, that they form upon and grow outward from slightly raised nuclei or projections, and in a horizontal rather than in a vertical position relative to the general surface of the objects or surfaces that they form upon.

The more perfect examples of this type of crystal, whether formed upon windowpanes, or in the open, invariably form around some tiny projecting frost or ice or other raised nuclei, and develop parallel to, and but slightly raised from, the general surface of the object or glass that supports them and their nuclei. They are commonly fastened so strongly to the objects that they form upon, that it is rarely the case that they can be secured entire for photographic purposes. Nos. 7, 20, 33, 34, 61, and 199 are, however, typical forms, and will serve to give a correct idea of this type of crystal. As will be noted, they possess systems of interior lines and shadings due to air tubes, etc. These correspond so closely in aspect, position, and arrangement with those that occur within the solid tabular portions of snow crystals as to leave but little doubt that they have a common manner of origin. Crystals of this type vary greatly in size one time with another, and one with another. They rarely attain a large size. Commonly they vary in size from one-eighth to one-twenty-fifth of an inch in greater tabular diameter, and in thickness from perhaps one-fiftieth to one-sixteenth of an inch.

(13) Type HTC. Solid tabular hoarfrost crystals exhibiting various stages of trigonal development.

Crystals of this type and character form under the same general conditions as exist during the formation of types HTA and HTB, and are often found associated upon the same object, or within the same confined spaces with them.

Why crystals so dissimilar in form should be the product of forces and factors seemingly so identical is one of the mys-

teries of crystallization. There is evidently much more in our crystallographic philosophy than we dream of, or understand. As previously set forth, it would seem that in some cases crystallic form and growth is guided and determined by interior and nucleal, or individual, rather than by external and abstract conditions.

Solid tabular hoarfrost crystals exhibiting various phases of trigonal development, are by no means rare, but it so happens that but few photographs of such have been secured for our collection. Nos. 8, 47 A, and 47 B will serve to convey an idea of their forms and structure. Lines and shadings, due to air inclusions, are prominent features of their interior structure.

Hoarfrost crystals of types HTB and HTC are usually of small size, viz, from one-twelfth to one-fourth inch in diameter.

(14) Type HTD. Open branch or tree-like forms.

Hoarfrost crystals grouped under this head possess an open branch-like structure, and commonly have one or more primary and many secondary rays all arranged in a very thin plane. This beautiful and frail type of hoarfrost seems to form most frequently during intense cold, when the temperature falls rapidly to zero or below. The crystals form upon and grow outward from various objects and in various situations, e. g., within barns and from the inside surfaces of barn doors, upon cobwebs and straw litter therein, and in the open upon ferns, grasses, etc., that overhang icy terraces or pools of water, the surfaces of brooks and pond ice, etc. Beautiful crystals of this variety often line open cavities in the snow or other partly closed cavities leading down to moisture, water, or wet soil. Individual crystals of this type sometimes attain to relatively large size, e. g., from 1 to 3 or more inches along their greater diameter

Photographs Nos. 11, 15, 16, 24, 158, 159, 160, and 190 portray a few of these beautiful frost creations, and also a few of the objects on which they form and which they adorn. No. 158 is a photograph of this type of frost, strung along the cobwebs hanging from a barn roof. No. 159 shows a beautiful plume-like cluster of such crystals arranged upon and around a straw stalk. No. 160 pictures them as formed in heavy white masses of clustered crystals upon the hay, barn roof, timbers, etc., of a barn loft above the stalls where cattle were kept. These, and also Nos. 24 and 158, are due to the condensation and crystallization of moisture exhaled in the breath of animals. No. 24 is an exquisitely beautiful example of this form of crystal. No. 190 is hardly less beautiful, and most remarkable because of its close resemblance to a tree.

(15) Type HTE. Less open, branch or tree forms.

Hoarfrost crystals of this type grow in a somewhat less open, branch-like manner than type HTD. They often consist of a large number of tiny solid tabular hexagons attached one to another, or to very short and broad branches, and arranged one outside another, all in a very thin plane. The facets of the many tiny hexagons gleam and glisten like so many diamonds and give a jewel-like appearance to the whole. These most interesting frost structures, like the preceding (type HTD), are very cold weather or zero (Fahrenheit) types. They form most frequently and in greatest number upon the bare surface of brook and river ice. They almost invariably grow upward and away from the surface of the ice. During long-continued below-zero weather large areas of river and pond ice may be thickly or completely covered with these beautiful leaf-like frost creations. Sometimes myriads of them are found clustered together into groups, like flower beds, on the surface of the ice, in the manner shown in photograph No. 170. This variety sometimes forms during a very cold night, and is found associated with other types of hoarfrost, particularly the types HTA and HTE, upon the trees and shrubs that clothe hillside and valley. Nos. 110, 111, and 208 formed in this manner upon the branches of trees, and were detached therefrom for photographic purposes.

The deposition of a heavy coat of hoarfrost of this description upon the trees in wooded regions produces a most beautiful effect, and sometimes converts a grove of trees into a fairy-land.

Photographs Nos. 13, 14, 110, 111, 168, 169, 170, 172, 173, 174, and 208 serve to reveal the forms and general outlines of this type of hoarfrost crystals. Photograph No. 174, of this series, is of more than ordinary interest. These crystals grew upward from basal points just below the streak of "Canada balsam" shown on the photograph and used by me to attach them to the glass microscope slide. At a late stage in their growth the fine frost work suddenly became of a more solid character than the portions formed before and after, as shown by the bands of larger crystals crossing the tabular structure. Atmospheric conditions were evidently such, during the formation of this more solid portion, as to cause a retardation in its rate of growth, and to favor the formation of nearly solid crystalline structures. Yet, after a time, the general conditions, such as prevailed during the formation of its basal portion, were reestablished, whereupon the crystals resumed their former and more open habits of growth.

(16) Type HTF. Stelliform crystals.

These form under identically the same conditions of temperature, humidity, position, etc., as those grouped under type HTB, and are often found associated with them upon the same objects. Why they fail to develop forms identical with those of type HTB can hardly be explained, except upon the supposition that nuclear differences exist, and impart their especial habits of growth to all subsequent accretions around the nuclei.

Tabular hoarfrost crystals of this description greatly resemble in all but symmetry certain solid tabular types of snow crystals. However, they rarely or never develop on a perfectly symmetrical plan as do many of the latter; commonly they develop in segmental form, because they usually crystallize upon objects in such a manner that but three or four of the six corners of the hexagon have an opportunity of growing outward from the nucleus.

[To be continued.]

COTTIER'S RESISTANCE OF ELASTIC FLUIDS.

The pressure of the wind for any given velocity, or the resistance of the air to a moving body, is one of the fundamental questions in the physics of the atmosphere. The subject has been treated experimentally by practical engineers and laboratory physicists for three centuries past; but their measurements have mostly served to show how little we understand the flow of air around and behind an obstacle. The physicist needs the guiding hand of a master in analytical mechanics. Summaries of the present state of experimental knowledge of the subject were attempted by myself in my lectures of 1882,[1] and in my Treatise on Meteorological Apparatus and Methods[2]; in a memoir by Capt. W. H. Bixby, U. S. Army Engineer Corps, in 1891; in Schreiber's Studien über Luftbewegungen, 1898; and in Bigelow's "Relations between wind velocities and atmospheric pressures".[3] The fundamental hydrodynamic formulas are given by Lamb, Basset, Love, Helmholtz, Wien, Auerbach, Saint Venant, Boussinesq, and other writers on hydrodynamics.

The late J. G. C. Cottier, author of the memoir on "The equations of hydrodynamics in a form suitable for application to problems connected with the movements of the earth's atmosphere",[4] left several excellent manuscripts bearing on

[1] Ann. Rep. C. S. O., 1882, pt. 1, p 98.
[2] Ann. Rep. C. S. O., 1887, pt. 2.
[3] Monthly Weather Review, October, 1906, (vol. XXXIV, p. 470).
[4] Monthly Weather Review for July, 1897, (vol. XXV, p. 296).

atmospheric phenomena, one of which we now publish by the kind permission of the President of Columbia University and of Prof. R. S. Woodward, the literary executor of Mr. Cottier. This short paper by Mr. Cottier is especially valuable as indicating the hypotheses or ideas on which his predecessors have based their researches.

By his mental grasp of the complex movements of the air near any obstacle, and his ability to express in rigorous formulas the mechanical reactions that result therefrom, Mr. Cottier gave promise of becoming a remarkably able investigator, and his untimely death was undoubtedly a great loss to meteorology.—*C. A.*

A SUMMARY OF THE HISTORY OF THE RESISTANCE OF ELASTIC FLUIDS.

By JOSEPH G. C. COTTIER. Dated Columbia University, New York, N. Y., April 27, 1896.

By elastic fluids are understood such fluids as air and other gases, and it is intended to restrict the discussion to such velocities only as are small in comparison to the velocity of sound in the gas. With the exception of ballistic problems and the motion of gases escaping freely from an orifice, almost all ordinary questions fall within this restriction.

Keeping the velocity within these bounds introduces a great simplification in the analysis, for then compressible fluids may, without gross error, be treated as incompressible.

Many writers claim to have discovered that the resistance offered to a moving body by a fluid at rest is not equal to the pressure exerted by a moving fluid on a solid at rest; but the experiments upon which this deduction is based are so unsatisfactory, and the statement itself so improbable, that no allowance has been made in the following essay for such a phenomenon.

The original papers of the writers referred to have been consulted whenever possible; otherwise the authority is given in a footnote.

The history of air resistance may be said to date from the time of Galileo. In his "Discorsi", 1638, he showed that, in consequence of the laws of falling bodies, discovered by him in 1602, the path of a projectile must be parabolic, *if not affected by the resistance of the air;* but his disciples disregarded this injunction, reasoning that a fluid as light as air could not appreciably affect the motion of so heavy a body as a projectile.[2]

In 1668-69 a committee of the Royal Academy of Sciences of Paris, consisting of Messrs. Huygens, Mariotte, Picard, and Cassini, made a series of experiments on bodies immersed in currents of water, and from these Huygens deduced the law that the resistance is proportional to the square of the velocity, and also that the pressure on a plane surface is the same as that due to a statical column of the fluid, of height equal to the head due to velocity.

According to Saint Venant,[3] Pardies showed as early as 1671 that for ships' sails the pressure should be proportional to the $\sin^2 \alpha$, where α has that meaning which will be assigned to it thruout this paper; i. e., it is the angle between the direction of the motion and the plane of the surface, or the complement of the "angle of incidence".

Certain it is, however, that in his "Traite du Mouvement des Eaux", published posthumously in 1686, Mariotte determined the law that resistance is proportional to the square of the velocity, from considerations based on the impact of the molecules of the fluid on the body; and that in the same paper he deduced geometrically the law that the pressure is proportional to the $\sin^2 \alpha$.

Mariotte died in 1684, and as Newton's "Principia" did not appear until 1687, the credit for the famous laws,

P is proportional to (Vel.)^2

and

P is proportional to $\sin^2 \alpha$,

which occur implicitly in Propositions 34 and 35, Book II, of the "Principia", belongs not to Newton, but to Huygens, and to Pardies and Mariotte, respectively.

By some experiments on falling bodies Newton was made aware of the fact that the Huygenian theory of hydrodynamical pressure was not in accordance with practise, and in Proposition 36, Book II, by a process that is unsatisfactory in the extreme, he corrected it so as to give a resultant pressure equal to *one-half* the pressure of a statical column of the fluid of head due to velocity, a result which agreed better with experiment than the first-named law. However, the geometers did not take kindly to Newton's amended theory, but clung to the original Huygenian law.

S'Gravesande, in his work on natural philosophy, 1725, was the first to disagree with Mariotte's or Pardies's law,

P is proportional to $\sin^2 \alpha$,

and to offer the law

P is proportional to $\sin \alpha$.

For small values of α this gives a better result than the former, and was deduced from the consideration that a fluid is not constructed of independent particles, but of a substance that has the property of exerting the same normal pressure in all directions.

Daniel Bernoulli, in 1727, proposed a theory which would have given hydrodynamical pressure equal in amount to the hydrostatical pressure of a column of water of twice the head due to the velocity, but he abandoned this later; and in a memoir published in 1736, making for the first time a distinction between the pressure exerted by an infinite fluid on a body and that due to an isolated jet, he derived that method of treating the latter which has survived to the present day.[4]

Maclaurin's contributions (1742) to this branch of science appear to be confined to the formula for the angle of maximum effort of windmill sails, when P is proportional to $\sin^2 \alpha$.

He found

$$\tan \alpha = \tfrac{3}{2}\frac{v}{V} + \sqrt{2 + \tfrac{9}{4}\frac{v^2}{V^2}}$$

where v equals velocity of the vane, and V that of the wind (at right-angles to the first). This is of importance as the first correction to the error in Mariotte's (1686) and Parent's (1704) analysis, which upon the same hypothesis gave α the constant value $55° \pm$, for the effect of the motion of the vane had been neglected.

Robins made a distinct step in advance when in his "New Principles of Gunnery", 1742, he described his apparatus for experimental determination of the resistance of the air, and gave the results of a few tests. This apparatus, the first of its kind, continued much in favor among the later English experimenters. The bodies under observation were fixt at the end of a horizontal arm, rotating about a vertical axis; a falling weight gave the power necessary to keep the arm in motion, and the revolving body itself served the purpose of a governor.

Robins's work was translated into French and annotated by Leonhard Euler. In a note the commentator attempted to obtain a mathematical explanation for the phenomena by summing the components in the direction of motion of the deviating forces necessary to deflect the stream lines from their originally straight path to their disturbed condition. Unfortunately, for a frictionless fluid, such a method gives zero for result, unless the posterior three-quarters of each filament be

[1] Submitted in partial fulfilment of the requirements for the degree of Master of Arts.

[2] Rühlmann, Hydromechanik, second edition, 1880.

[3] B. de Saint Venant, Resistance des Fluides. Published posthumously in the Memoires of the Paris Academy, 1888.

[4] B. de Saint Venant, op. cit.

neglected; and later Euler had to return to the older theory of molecular impact.[5]

D'Alembert's "Nouvelle Theorie de la Resistance des Fluides", 1752, is an important contribution to the science of hydrodynamics. In it may be found a note of an analysis mathematically equivalent to what is now known as "Earnshaw's current function", but altho d'Alembert used complex quantities in his attempts to obtain solutions he found difficulty in integrating the equations which result, and no immediate consequences of his theory followed.

Borda's famous experiments on air resistance were made public in 1763. His apparatus differed from Robins's mainly in having the moving body supported on a vertical arm rotating about a horizontal axis, instead of the reverse. His experiments dealt with small plates, and with prismatic, conical, and ogeeval bodies; from the series of tests on small plates it would appear that

$$P_{90^\circ} \text{ is proportional to } S^{1.1}$$

(P_{90° = total normal pressure, plate exposed at right-angles to direction of wind; S = surface of plate), a law apparently much in favor among the French physicists.

Even as late as 1768, no valid explanation had been offered of the apparent paradox encountered by Euler, for in d'Alembert's "Opuscules" we find him commenting on the peculiar fact that according to the analytical theory of deflected stream lines, a body should be subjected to no resistance, a circumstance which he very kindly "leaves for elucidation to the geometers". However, many experiments had already appeared, and more were soon to follow, that would bring forcibly before the minds of physicists the reality of the resistance encountered.

In 1759, Smeaton communicated to the Royal Society at London that well-known table of wind pressures at different velocities which is generally known by his name. The table is really due to a certain Rouse, a friend of Smeaton's.

If V be the velocity in miles per hour, and P_{90° the normal force in pounds per square foot, Rouse's experiments are well represented by

$$P_{90^\circ} = 0.005\ V^2.$$

It is not easy to find who first proposed this formula, but Eytelwein, about 1800, deduced an equivalent formula from Woltmann's and Schoeber's experiments; i. e.,

$$P_{90^\circ} = \tfrac{4}{3}\,\frac{S}{2g}\,V^2$$

where V is the velocity in feet per second, and S is the specific weight of the fluid.[6]

Hutton (as also Rouse) made use of a Robins apparatus when, in 1787, he made the first reliable series of experiments establishing the relation of the air resistance to the angle of exposure, a. If P_a is the intensity of the normal pressure on a plane exposed at an angle a to the wind, Hutton gives

$$P_a = P_{90^\circ}\,(\sin a)^{1.842 \cos a - 1}$$

Experiments were also made by Hutton on bodies of forms occurring in artillery practise, and the agreement with Borda's results is fairly good.

The experimental work of Vince (London Philosophical Transactions, 1798) brings us to the close of the eighteenth century. Up to this late date no more satisfactory theory of the resistance of fluids had been offered than the Huygenian, that the impinging fluid lost all its momentum upon impact, so that while the face upstream was subjected to hydrodynamic *plus* hydrostatic pressure, that downstream experienced *only* the hydrostatic pressure. Of course some writers had combatted this view; Don Georges Juan, in 1771, and Professor Romme, in 1787, had suggested that the pressure on the downstream side might depend not alone on the hydrostatic pressure of the fluid, but on the difference between it and the hydrodynamic pressure.[7] Unfortunately, such a hypothesis gave a result about twice as large even as the Huygenian.

Poncelet (Introduction à la Mécanique Industrielle, 1829) offered a new explanation, based on an empirical law deduced by Du Buat from hydraulic experiments made by Messrs. d'Alembert, Condorcet, and Bossut in 1777. This law stated that all the particles of a fluid which are affected in the direction of their motion by the presence of an immersed body, may be included within a cylindrical surface whose axis is parallel to the direction of motion, and whose cross section is 6.46 times the maximum cross section of the body; or that the fluid remains undisturbed at a distance in any direction of about three-quarters ($\frac{3}{4}$) of the diameter of the solid. To Poncelet, then, all problems relating to the resistance of solids to moving fluids reduced themselves to the case of a body suspended centrally in a tube filled with that fluid, with cross section equal to 6.46 times the greatest cross section of the body, and with sides of such material as to offer no frictional resistance to flow. Allowing then for a further contraction of cross section of the jet because of a phenomenon similar in character to the contraction of a free jet, the total drift pressure might be found by computing the change of momentum of the fluid in the normal and the contracted portions of its path.

Altho neither very satisfactory nor withal very fruitful this hypothesis forms the basis of de Saint Venant's extensive memoir already referred to, "Sur la Resistance des Fluides", which was written principally in or about 1847.

About 1825 the Paris Academy of Sciences offered a prize for the best exposition of the theory and practise of the resistance of fluids, which offer was instrumental in bringing to light at least two important contributions to the subject, altho the prize itself was never awarded.

A little later, in 1826, Lieutenant Thibault's results were published; his experiments were made on small planes, 0.327 meter to 0.454 meter on a side, exposed normally to the air on a Borda apparatus. As interpreted by de Louvrié,[8] these experiments give

$$P_{90^\circ} = 0.115^{kg}\ V^2$$

where V is in meters per second; and P is the net normal pressure in kilograms per square meter.

A memoir by Colonel Duchemin was submitted in 1828 in competition for the above-mentioned prize, receiving "honorable mention". In this memoir will be found the formula for the normal pressure on an inclined plate in terms of that on a plate whose plane is perpendicular to the direction of the wind,

$$P_a = P_{90^\circ}\,\frac{2 \sin a}{1 + \sin^2 a}$$

This is probably the most reliable formula yet offered, and is generally known as "Duchemin's formula", altho as he offered it there was an additional factor,

$$1 + \frac{\cos^2 a}{15 \sin^2 a}$$

The prize of the Paris Academy having been offered again and again, without bringing any contribution satisfactory to the committee, the prize was withdrawn from competition, and its value awarded to Messrs. Didion, Piobert, and Morin, "à titre d'encouragement". Their paper dealt mainly with the resistance of projectiles; but in it is found an account of experiments made with horizontal planes, 0.25 to 1 square meter in area, falling vertically thru a height of 12 meters,

[5] B. de Saint Venant, op. cit.

[6] Young's "Summary of Eytelwein's Hydraulics", in Tredgold's "Tracts on Hydraulics".

[7] B. de Saint Venant, op. cit.

[8] Proceedings Chicago Conference of Aerial Navigation, 1893.

with a velocity varying from 0 to 9 meters per second. These gave

$$P_{90^\circ} = \frac{\delta_0}{\delta}(0.036 + 0.084\ V^2),$$

where P_{90° is the intensity of normal pressure in kilograms per square meter, δ_0 and δ are the normal and actual specific weights of the air, and V is the velocity in meters per second.

In Germany Professor Schmidt of Göttingen in 1831 had offered the formula

$$R = \beta \cdot \frac{e^{q-1} - q}{q},$$

where $q = \frac{V^2}{2\alpha}$ and α and β are constants.[9] Unfortunately this paper is not available to me, and the hypothesis upon which it is based is therefore unknown.

A remark by the astronomer Bessel, in 1828, that the time of oscillation of a pendulum was affected by the necessity of moving the circumambient fluid, with a result equivalent to increasing the effective mass of the pendulum, caused Poisson in 1831 to send to the Paris Academy of Sciences an important memoir on the motion of a spherical pendulum in air, in which he attempted to account for both the kinetic and the frictional resistances. George Green, more modest, in 1833 gave the complete solution for the translational motion of an ellipsoid in a frictionless fluid; the more general case of combined rotation and translation was not made public until 1856, by Clebsch.

In 1842, Stokes in England adapted Earnshaw's previously introduced "current function"[10] to solids of revolution moving axially, and with its aid, Stokes in 1850 was able to solve satisfactorily the problem of such a body moving in a viscous fluid, the velocity of the solid being so small, however, that its square is negligible. This problem has engaged the attention of many physicists since that time, among others, Messrs. O. E. Meyer, Oberbeck, R. Hoppe, C. J. H. Lampe, and Boussinesq, with the object of applying the results to the determination of the coefficient of internal friction of fluids.

Passing again to France we find Dupré in 1864 offering the rational formula for resistance—

$$P_\alpha = P \cdot \left(e^{+Av^2 \sin^2 \alpha} - e^{-Av^2 \sin^2 \alpha}\right),$$

where P_α is the intensity of the normal pressure in kilograms per square meter, P is the aerostatical pressure in kilograms per square meter, and $A = \frac{1.3\rho}{2P} \cdot \frac{T_0}{T}$, ρ being specific mass, and T and T_0 absolute temperatures.

Von Helmholtz's works in this field are few in number, but, as might be expected from his genius, of the utmost importance. It was from a suggestion contained in one of his memoirs, bearing the date 1873, that M. Thiesen deduced the general form of the equation of resistance,

$$P_{90^\circ} = \rho\, v^2\, l^2 \cdot \varphi\left(\frac{\mu\, v\, l}{\rho\, v^2\, l^2}\right),$$

where ρ is the specific mass, v the velocity, l a linear parameter, φ any function of $\frac{\mu\, v\, l}{\rho\, v^2\, l^2}$, and μ the coefficient of internal friction. This theorem is of great value in establishing the relation between the resistances of similar bodies in different gases or in the same gas under different conditions.

[9] J. C. F. Otto, "Beitrage zur Ermittelung des Luftwiederstandsgesetz," Zeitschrift für Math. und Physik, Vol. II, 1866.

[10] Earnshaw's current function is an expression giving the paths of all the particles of an incompressible, frictionless fluid, moving so that the motion is all parallel to a certain plane, or is "two-dimensional"; and furthermore, so that the motion is "irrotational", one of "pure strain", or possessing a "velocity potential". Such a function has important analytical properties.

Von Helmholtz's most important memoir is that on the theory of "discontinuous motion" in two dimensions, first offered in 1868. Kirchoff applied this method to the stream lines of a fluid past a plane lamina, without, however, calculating the resultant pressure. Lord Rayleigh, in 1876, independently of any knowledge of Kirchoff's work, arrived at the result, but pushed his researches to the point of obtaining the pressure per unit length on such an infinitely long plane lamina immersed in an infinite, frictionless fluid. He obtained

$$P_\alpha = \frac{\pi \sin \alpha}{4 + \pi \sin \alpha} \frac{4 + \pi}{\pi} P_{90^\circ}$$

which is perhaps the most satisfactory rational formula yet offered for the resistance of a long, narrow plane exposed obliquely to a current.

In the same memoir will be found an expression for the position of the center of pressure on such a plate. If l is the breadth of the lamina, and d is the distance of the center of pressure from the center of the lamina, we obtain

$$d = \frac{3}{4} \frac{\cos \alpha}{4 + \pi \sin \alpha}\, l.$$

The best empirical formula for this quantity, that of Jöessel (1870), gives

$$d = (0.3 - 0.3 \sin \alpha)\, l,$$

which while not exactly agreeable to Lord Rayleigh's, yet offers less discrepancy than might well have been expected, considering the difference of the conditions.

Bobyleff in 1881 applied the theory of discontinuous motion to obtain the resultant drift on a wedge formed of two planes, each of breadth l, inclined at an angle of 2α to each other and at an angle α to the direction of the current. (See fig. 1.)

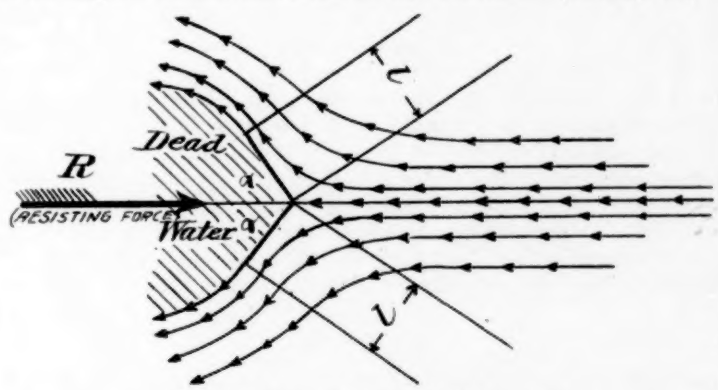

FIG. 1.—Motion of a fluid past a wedge.

In this case,

$$R = \rho\ V^2\ S \frac{2\alpha^2}{\pi\ \lambda},$$

where

$$\lambda = 1 + \frac{2\alpha}{\pi} + \frac{4\alpha^2}{\pi^2} \int_0^1 \frac{x^{-\alpha/\pi}}{1+x}\, dx,$$

ρ = specific mass, V = velocity, S = area = $2lh$, and 2α = the angle of the planes.[11]

Owing to the impossibility of formation of such a surface as is here supposed, this theory and the results obtained by it have been criticized by many. Some sort of surface of discontinuity may of course be formed, and Lord Kelvin in 1887 offered his theory of "coreless vortices" as being nearer the physical conditions.

Among the various rational formulas proposed since Lord Rayleigh's may be mentioned that of Professor Ferrel,

$$\log_{10}\left(1 + \frac{P_{90^\circ}}{P}\right) = \frac{V^2}{360{,}940} \frac{T_0}{T},$$

[11] Lamb, "Hydromechanics", 1895.

where P_{90° is the intensity of the net normal pressure, P is the aerostatical pressure, V is the velocity in meters per second, and T and T_0 are absolute temperatures.

This formula does not rest on a sound basis, for it may be derived from that given by Lord Rayleigh, by expanding and rejecting the higher powers of $\frac{V}{a}$ than the square

$$P_{90^\circ}=P\left\{\left(1+\frac{r-1}{2}\,\frac{V^2}{a^2}\right)^{\frac{r}{r-1}}-1\right\}$$

for the resistance that would be encountered if the impinging filament of fluid could be supposed to disappear absolutely, after imparting all of its momentum to the plate; (r is here equal to the ratio of the specific heats of the gas at constant pressure and at constant volume, and a is the velocity of sound in the gas).

E. Toepler[12] in 1887 proposed a formula based on considerations derived from the molecular theory of gases:

$$P_{90^\circ}=4\,P\frac{V}{\Omega},$$

where, as before, P is the aerostatical pressure, V the velocity of the plate, and Ω the mean molecular velocity of the particles of the gas. Experiments made by G. A. Hirn, in 1882, appear, however, to disprove any such immediate dependence of the resistance on the temperature as is here implied, when the density remains constant.

Ch. de Louvrié's formula (1890),

$$P_a=\frac{2\sin a\,(1+\cos a)}{1+\cos a+\sin a}\,P_{90^\circ}$$

is quite satisfactory. The basis for the physical considerations on which this rational formula is founded may be discovered in Colonel Duchemin's experiments.

The latest addition to this collection of formulas, that of Lord Kelvin (1894), requires a word of explanation.

The resistance experienced by a moving solid in a "perfect" or frictionless fluid would be zero, if no surface of discontinuity were formed, or if the fluid obeyed the so-called "electrical law" of flow, requiring under certain conditions an infinite tension to be resisted. The kinetic energy of the body would, however, be changed by the presence of the fluid, and the additional kinetic energy is found to be

$$T=\frac{\pi\rho\,a^2v^2}{2}$$

per unit of length of an infinitely long lamina of breadth a; or

$$T=\tfrac{4}{3}\rho\,c^3v^2$$

for a circular plate of radius c, ρ in both cases being the specific mass of the fluid, and v the velocity in a direction normal to the plate.[13]

These results were obtained by supposing the minor axis of an elliptical cylinder, and the shorter axis of a prolate spheroid, respectively, to become equal to zero. The motion of the fluid is in both cases irrotational, and therefore in the first case, for an infinitely long lamina, it could have been generated by an impulsive pressure of

$$F=\frac{\pi}{4}\rho\,a^2v$$

per unit length. From this value of the impulsive pressure and from the assumption of a velocity in its own plane of u, that is large compared with v, Lord Kelvin found the resistance to be

$$P_a=\frac{\pi}{2}\rho\,u\,v$$

which is equivalent to

P_a is proportional to $\sin a \cos a\ V^2$

[12] Wiedemann's "Beiblätter" Vol. XI, 1887, p. 747. [13] Lamb, op. cit.

for a small, and the length great compared to the breadth in the direction of motion.

A brief account of the most notable series of experiments since 1870 must close this summary.

The measurements of G. H. L. Hagen (1874) have become classic; they may be exprest by

$$P_{90^\circ}=(0.00707+0.0001125\,p)\,V^2,$$

where P_{90° is the intensity of normal pressure in grams per square decimeter, V is the velocity in decimeters per second, and p is the perimeter in decimeters. Unfortunately this formula can not be safely applied to plates of more than 20 centimeters on a side.

L. de Saint Loup (1879), for a plate 10 by 20 centimeters, found

$$P_a=0.1768\,(4\sin a-1)\,(11\,V+1.061\,V^2)$$

where P is the pressure in grams per square decimeter, and V is the velocity in meters per second.

From the above-mentioned experiments of G. A. Hirn, in 1882, and from the carefully executed tests of Messrs. Cailletet and Colardeau in 1893, it appears definitely settled that, even for different gases, *the resistance is not directly affected by the temperature, but only indirectly thru the resulting change of density, and that this resistance is directly proportional to the density of the gas and to the square of the velocity of the vane.*

Otto Lilienthal, in 1889, experimented on the resistance of curved vanes, but without arriving at a satisfactory general formula.

Lieutenant Crosby in 1890 published an account of a series of experiments purporting to show that the resistance of the air was directly proportional to the velocity instead of to its square, but these experiments are not viewed with much favor.

Mr. W. H. Dines' extensive tests, also in 1890, on small plates exposed both normally and at an angle to the wind, give

$$P_{90^\circ}=0.0029\,V^2$$

where P_{90° is the pressure in pounds per square foot, and V is the velocity in miles per hour; the measurements with the plate exposed obliquely have not been embodied in a formula.

This list is fittingly closed by a mention of Mr. S. P. Langley's very satisfactory experiments, published in 1891. His most refined apparatus gave, as the probable value of the normal pressure P_{90° on a plate exposed at right-angles to the direction of the wind, on planes of from 6 to 12 inches on a side

$$P_{90^\circ}=0.0087\,\frac{\delta}{\delta_0}\,V^2,$$

where P_{90° is the pressure in grams per square centimeter, V is the velocity in meters per second, δ is the specific weight of the air at the time of the experiment, and δ_0 is that for a pressure of 760 millimeters mercury and at a temperature of 10° centigrade. Mr. Langley's experiments on planes exposed at an angle to the current of air agree so nearly with Colonel Duchemin's formula,

$$P_a=\frac{2\sin a}{1+\sin^2 a}\,P_{90^\circ},$$

that no new one is offered.

LOCAL FORECASTING AT ESCANABA.

By W. P. STEWART, Observer, Weather Bureau. Dated Escanaba, Mich., August 31, 1907.

Aside from, or rather superimposed upon, the more or less regular sequence of weather changes due to passing cyclones and anticyclones, most localities have a system of minor variations caused by local peculiarities of topography or location with regard to neighboring bodies of water, etc. In some cases these minor variations become so pronounced as greatly to modify the current weather of the region. Probably in no portion of the United States is this more noticeable than in the upper Lake region. The water of the Lakes, relatively

cool in the spring and summer and relatively warm n the fall and winter, is the dominating factor in determining the weather of this region.

At Escanaba, Mich., on account of its location on the western shore of Little Bay de Noc, an arm extending northward from the northern end of Green Bay, the weather is greatly modified by local influences. Daily temperature changes during the spring, summer, and fall are dependent largely upon the direction of the wind with regard to the waters of the bay. The temperature of Green Bay, owing to its landlocked position, rises very slowly in spring. For this reason, except in extreme cases, cool weather may be forecast with safety from April to September whenever it is expected that the wind will shift to the south or southeast, or warmer when the wind is expected to shift to the southwest or west. So pronounced is this effect that in the case of a rapidly shifting wind the rise and fall of temperature are often too rapid for the thermograph to follow, sometimes amounting to 10° or 15° in as many minutes. During the seasons mentioned the warmest days at Escanaba come with a southwest or west wind, when a barometric depression is moving eastward over Lake Superior, and the highest temperature occurs when the low is central toward the eastern end of the lake. This, evidently, is simply a case of warmer air coming from off the land, and if it accompany a rapidly moving disturbance the warm weather will be of brief duration, a sharp fall in temperature occurring when the wind shifts to northwest.

In forecasting for this region it should be borne in mind that barometric depressions will usually decrease in energy as they approach the Lakes during the spring and early summer and increase during the fall and winter, the apparent reason being that convectional action is less energetic over the relatively cool waters in the former season and greater over the relatively warm waters in the latter.

During the spring and early summer it is unsafe to forecast precipitation from an approaching low so long as the wind is expected to come from Green Bay; the obvious reason is that as the air passes from the water to the land its temperature rises, which increases its capacity for the vapor of water. During the season mentioned it is also unsafe to forecast thunderstorms with a southeast or south wind, except in pronounced cases. Thunderstorms often may be seen approaching from the west when the wind is from the southeast or south, but when almost overhead, and when thunder is momentarily expected, they begin to dissolve, and soon only a few strato-cumulus clouds are left. Thunderstorms require for their continued action an abundance of warm, moist air near the ground. While the air from over Green Bay probably contains sufficient moisture, its initial temperature is too low to give it the necessary ascending movement. Late in the summer, when the waters of Green Bay become warmer, this effect is less noticeable.

During the fall, winter, and spring, when a high is in the St. Lawrence Valley, and a low is approaching from the west, the sequence of changes attending the passage of a cyclone should be forecast only with extreme caution. Under these conditions the low may remain nearly stationary for two or three days, or it may even move westward. From Bowie's method of determining the probable movement of a depression this is what should be expected; and if it be remembered that the high appears to have difficulty in getting out of the St. Lawrence Valley, and is itself likely to remain practically stationary for forty-eight hours, this method may be used in these cases with a high degree of success.

Cold waves should be forecast for Escanaba only under exceptional conditions. Owing, probably, to the protection afforded by Lake Superior, cold waves are felt much more severely both to the eastward and to the westward than at Escanaba. A cold wave approaching from the northwest, which would appear likely to pass directly over this station, will usually be diverted to the westward, and extremely cold weather will arrive about twenty-four hours late, that is, when the crest of the high is well down the Mississippi Valley and the wind has backed to the southwest. In these cases it is usually 10° colder at Green Bay than at Escanaba. Another class of cold waves, coming apparently from Hudson Bay, passes southward over the eastern end of Lake Superior. The cold from these highs comes very quickly, but the temperature is usually 15° to 20° lower at Sault Sainte Marie than at Escanaba.

LIGHTNING PHENOMENA.

By Dr. Irving Langmuir. Dated Stevens Institute, Hoboken, N. J., September 11, 1907.

I have read with interest an account of a peculiar phenomenon in connection with a flash of lightning, on page 228 of the May, 1907, number of the Monthly Weather Review.

I have also seen such phenomena and would like to bear testimony to their occurrence on not very rare occasions, at least in the mountains of Switzerland. I remember three storms I have witnessed at different times in which flashes of lightning left their paths distinctly marked by strings of fire beads. Two of these storms were in the Alps, one at Berchtesgaden in southern Germany, and one on the mountain near Lake Lucerne, in Switzerland. The third was at Jackson, N. H., in the White Mountains. Each of these three storms was exceptionally violent, among the most violent I have ever witnessed. The phenomenon was observed only with flashes which were comparatively close, within perhaps 2000 feet. In each storm several flashes left beaded trails, but not every flash which struck near by exhibited that peculiar appearance.

I should estimate the time during which the beads remained visible as at least one second, a time amply sufficient to observe distinctly. It appeared to me that the whole course of the flash remained luminous, with a dull red glow, but that at intervals along the path bright points like sparks appeared to remain suspended in the air. The sparks appeared to be moving horizontally as tho blown along by the wind.

I have spoken many times with others about the phenomenon, but have met no one, even among experienced mountaineers, who had observed anything like it. I had, therefore, begun to suspect that the phenomenon was of a subjective nature, that is, was due to some peculiar impression left upon the retina of the eye by the brilliant discharge. The appearance of the sparks drifting along with the wind is strong evidence against this theory.

SALTON SEA AND LOCAL CLIMATE.

An editorial in the New York Daily Tribune of March 4, 1907, suggests that the Weather Bureau should have at hand data to decide whether the formation and presence of the Salton Sea has an appreciable influence on local climate. Now, without waiting for special local observations of temperature or moisture, we can easily demonstrate the slight influence of this sea on the general climate, especially on the rainfall.

The Salton Sea has an estimated area of 400 hundred square miles and an average depth of less than 80 feet. The total volume of water may be 400 by $(5280)^2$ by 70 cubic feet,[1] equivalent to a depth of 28,000 feet over 1 square mile, or 1 foot over 28,000 square miles, or about 2 inches over the 158,000 square miles of California, and is much less than falls in almost any one area of low pressure during the few days of its progress over the United States. This amount of water would suffice to provide for the irrigation of the whole 300 square miles of the Imperial Valley for forty or fifty years, if that region required only 20 inches in depth per annum. Therefore the practical question is not how much the Salton Sea can affect climate, but how its waters can be used for irrigating the lands that surround it.—*C. A.*

[1] As estimated by Mr. A. P. Davis. See his paper in the National Geographic Magazine, January, 1907.

TORNADO AT MAPLE PLAIN, MINN.

A destructive tornado visited Maple Plain and other points in the western portion of Hennepin County, Minn., during the evening of Sunday, August 18, 1907. Some mention of the storm is made in the August report of the Minnesota section of the Climatological Service, edited by Mr. U. G. Purssell, section director, who has sent us the original accounts. We are chiefly indebted to Mr. George W. Richards, the cooperative observer of the Weather Bureau at Maple Plain, which is about twenty miles west of Minneapolis.

According to Mr. Richards the hour was 7:35 p. m. The day had been warm and oppressive, the maximum temperature during the afternoon being 88°, and heavy, threatening clouds preceded the appearance of the tornado. No funnel-shaped cloud was observed, but there may have been such a cloud, obscured from view by the heavy downpour of rain.

The path of destruction varied in width from a few rods to a quarter of a mile. The severity of the storm was first felt near Lyndale, 4 miles southwest of Maple Plain, where grain and haystacks were torn down and scattered. Thence it moved northeast to Armstrong, 1 mile west of Maple Plain, where it did great damage to a barn, a graveyard, and the fields in its path. The tornado crost the railroad track half a mile west of Maple Plain and continued thru a belt of timber and an orchard, blowing down or breaking off many telegraph poles and trees. The greatest damage was done about a mile or more northeast of Maple Plain, where the tornado swept down a hill and with seemingly increased energy traveled along the southern shore of Lake Independence, demolishing several cottages and barns, in which many persons were injured, one of them fatally.

To the east of the lake the tornado laid flat a great deal of timber, and continuing toward Osseo did much damage in the vicinity of that town, which is 15 miles east-northeast of Maple Plain. The general direction of the motion of the storm was from west-southwest to east-northeast and the path was about 20 miles in length. The storm was evidently a tornado, as on the south edge of the path the trees were blown from the southwest or south, while on the north side the trees were blown from the northwest. Outside of the path of destruction a heavy windstorm prevailed. At Maple Plain 0.12 inch of rain fell Sunday morning and 1.70 inches in the evening.

It is worth noting that at 10 a. m. on the forenoon of the 18th a very severe wind and hailstorm had occurred 2 or 3 miles southeast and south of Maple Plain, a narrow strip extending from southwest to northeast being affected.—*H. C. H.*

HAIL SHOOTING IN ITALY.

The references to this subject in previous volumes of the MONTHLY WEATHER REVIEW have abundantly shown the probability that there is no rational basis for the efforts made in Italy and France to break up thunderstorms and prevent injurious hail by some method of cannonading. Neither the noise, nor the smoke, nor the heat, nor the commotion produced by grand vortex rings can be expected to have any considerable influence on the enormous cumuli from which hail and lightning proceed. This conviction is now confirmed by a report read before the Royal Academy of Sciences at Rome (Accademia dei Lincei), on December 2, 1906, by Senator P. Blaserna, who is also Professor of Physics in the Royal University at Rome, and President of the Accademia dei Lincei. In 1902, Professor Blaserna was appointed by the Italian Government president of a special commission to investigate this subject. A locality that had suffered extremely in previous years was chosen as the field of operations, viz, Castelfranco, in Venetia, and 222 cannon of the most approved special type manufactured by the Greinitz Company were established; each of these sends up a vortex ring 4 meters in diameter, and one additional cannon sending up a vortex 14 meters in diameter was subsequently added. As these vortices failed to ascend higher than 200 or 300 yards they evidently had no effect on the clouds; therefore a higher station, the Casa Aulagne di Monteux, was occupied, so that the vortex rings attained 1200 yards, but still no good results were perceived.

Then the secretary of war and the manufacturers of pyrotechnics were appealed to. Of the latter, Marazzi, at Rome, succeeded in constructing bombs weighing 8 kilograms that were carried up to 800 meters where they exploded. During 1906, 250 broadsides were fired by the 222 cannon at Aulagne, and 60 of the Marazzi bombs were sent up, but still no good effects were perceptible. These negative results of a five-year campaign justify the commission in recommending that the Italian Government no longer encourage such expensive and useless work.—*C. A.*

INFLUENCE OF THE GLASS COVER ON ACTINOMETRIC THERMOMETERS.

By LADISLAUS GORCZYNSKI.

[Translated from Meteorologische Zeitschrift, May, 1907, p. 212-218, by R. A. Edwards.

By actinometric thermometers we mean, in this memoir, mercurial thermometers in which the glass reservoir is not directly exposed to the sun's rays, but is covered by an absorbing layer of lampblack. It is clear that in such a case the primary source of heat variation lies in the absorbing layer of lampblack, so that the thermal condition of the whole thermometric body can not be deduced directly or simply from the indications of its purely thermometric part, i. e., the mass of mercury. It is entirely conceivable that, in some cases, the assumption that the actual temperature variation is identical with that of the mercury may be proper; but with the increasing complexity of the actinometric body the conditions are surely not always so simple, and in such cases a previous investigation of the actual distribution of temperature in the body will be absolutely necessary. It is, therefore, very important that it be clearly understood what is meant by "bodily temperature" in the case of a complex structure.

We will take up only one special case, and consider the actinometric thermometer constructed by Prof. O. Chwolson in 1893 according to the Ångström principle. We will, by this example, show what an important part must be attributed to the glass covering of the actinometric thermometer.

I. We will consider three superposed layers, consisting of lampblack, glass, and mercury.

In Table 1, where these layers are mentioned in their proper order, is given the notation adopted by us.

TABLE 1.—*Location of layers and adopted notation.*

	Thickness.	Temperature.	Surface.	Coefficient of internal conduction.
Air	....	τ	....	....
Lampblack	d'	θ' outer surface	s_1	k'
Glass	d	t_e outer surface t_i inner surface	s_2	k
Mercury	d''	θ''	s_3	k''

We wish to learn the difference, $\theta' - \theta''$, in case the outer layer of lampblack is exposed to the direct rays of the sun.

If by q we represent the intensity of the energy of the radiation (per unit of time and surface, always assuming a normal exposure), by h the coefficient of external conduction of heat, and by τ the temperature of the surrounding layer of air, we

have for the energy that is conveyed to the outer layer of lampblack, the expression

$$q-h(\theta'-\tau) \qquad (1)$$

where the subtrahend expresses the energy radiated from the outer layer of lampblack. This part is assumed to be proportional to the temperature excess, $\theta'-\tau$.

The energy that passes thru any given unit of surface s_1, in the interior of the layer of lampblack, is

$$\frac{k'}{d'}(\theta'-t_e) \qquad (2)$$

Likewise, for a unit surface s_2 in the interior of the glass, the energy will be

$$\frac{k}{d}(t_e-t_i) \qquad (3)$$

where it is assumed that the temperatures in the glass between t_e (at the outer surface of the glass) and t_i (at the inner surface of the glass) have a uniform gradient.

Finally, for a unit surface s_3 in the mercury[1] we have

$$\frac{k''}{d''}(t_i-\theta'') \qquad (4)$$

For a steady state, and under the conditions that obtain for the special case that interests us, we may assume that

$$q-h(\theta'-\tau)=\frac{k'}{d'}(\theta'-t_e)=\frac{k}{d}(t_e-t_i)=\frac{k''}{d''}(t_i-\theta'') \qquad (5)$$

from which we derive

$$q-h(\theta'-\tau)=\frac{\theta'-\theta''}{\frac{d'}{k'}+\frac{d}{k}+\frac{d''}{k''}} \qquad (6)$$

or

$$\theta'-\theta''=\frac{\frac{d'}{k'}+\frac{d}{k}+\frac{d''}{k''}}{1+h\left(\frac{d'}{k'}+\frac{d}{k}+\frac{d''}{k''}\right)}\cdot[q-h(\theta''-\tau)] \qquad (7)$$

The difference

$$\theta''-\tau=T \qquad (8)$$

represents the excess of the temperature of the mercury over that of the air. This excess, which can be easily derived from the observations, we will represent by T. The formula

$$\psi=\theta'-\theta''=\frac{\frac{d'}{k'}+\frac{d}{k}+\frac{d''}{k''}}{1+h\left(\frac{d'}{k'}+\frac{d}{k}+\frac{d''}{k''}\right)}[q-hT] \qquad (9)$$

gives us the desired difference between the temperatures of the mercury and the outer black surface in the case of heating by insolation; the analogous difference (φ) for cooling in the shade will be found directly from the formula (9), by making $q=0$. It is, therefore,

$$\varphi=\theta''-\theta'=\frac{\frac{d'}{k'}+\frac{d}{k}+\frac{d''}{k''}}{1+h\left(\frac{d'}{k'}+\frac{d}{k}+\frac{d''}{k''}\right)}hT \qquad (10)$$

II.—Let us especially consider the formula proposed for the actinometer[2] constructed by Professor Chwolson in 1893, which served to determine the intensity of solar radiation from the simultaneous observations of two "actinometric" thermometers, alternately exposed to the sun and in the shade, respectively.

We do not go into the details of the derivation of this formula, which have been given fully in Chwolson's memoir,[3] and we remark only that his definitive formula has the form

$$q=Kw;\quad K=\frac{2c}{\sigma};\quad w=\frac{1}{t}\,\frac{\theta_2^2-\theta_1\theta_3}{\theta_1-\theta_3} \qquad (11)$$

where K represents an instrumental constant, c=thermal capacity, σ=absorbing surface, whereas w is given directly by each measurement as a function of t (the interval of time) and θ_1, θ_2, θ_3, which are the simultaneously observed differences of temperature of the two bodies.[4]

The definitive formula has been derived as a particular solution, under certain limiting conditions, which are practically admissible, of the following system of differential equations that expresses the variable thermal condition

$$\left.\begin{aligned} q\sigma dt&=cdT+\sigma hTdt\\ 0&=cdT+\sigma hTdt\end{aligned}\right\} \qquad (12)$$

The first of the two equations that constitute the system (12), and that must hold good simultaneously, relates to the "actinometric" thermometer which is warming under insolation, while the second equation relates to the other thermometer which is simultaneously cooling in the shade. In the deduction of these equations the temperature excesses, T, refer directly to the readings given by the mercurial columns, and it is taken for granted that when the columns of mercury both have the same height in the two thermometers, there is also the same equality of temperature for the glass covers and in general for both actinometric bodies. On the other hand, we will show that in practise it is not to be assumed that the changes of temperature that measure the radiation are the same as those given by the readings of the thermometer. In this connection a change must be made in the definitive formula (11).

III.—We start with the assumption that for values of T simultaneously observed not the system (12), but the differential equations (13) hold good,

$$\left.\begin{aligned} q\sigma dt&=cdT+\sigma h(T+\psi)\,dt\\ 0&=cdT+\sigma h(T-\varphi)\,dt\end{aligned}\right\} \qquad (13)$$

where ψ and φ represent the above-mentioned differences. Since for the Ångström-Chwolson actinometer, the simplifying assumptions—

(a) that the thickness of the layer of lampblack is infinitesimal,

(b) that the thickness of the mercury layer is also negligible, seem to be practically admissible therefore formulas (9) and (10) give the following values for ψ and φ:

$$\left.\begin{aligned} \psi&=\frac{\frac{d}{k}}{1+h\frac{d}{k}}\cdot(q-hT)\\ \varphi&=\frac{h\frac{d}{k}}{1+h\frac{d}{k}}\cdot T\end{aligned}\right\} \qquad (14)$$

If we introduce these values in (13), we obtain a new system of differential equations

$$\left.\begin{aligned} q\sigma dt&=c\left(1+h\frac{d}{k}\right)dT+\sigma hTdt\\ 0&=c\left(1+h\frac{d}{k}\right)dT+\sigma hTdt\end{aligned}\right\} \qquad (15)$$

which exist simultaneously but for two thermometers under different thermal conditions

The differential equations (15) are entirely analogous to

[1] The influence of convection currents on the temperature distribution within the mercury will be neglected.

[2] See Monthly Weather Review, April 1907, pp. 171, 172, and fig. 1.

[3] Aktinometrische Untersuchungen zur Konstruktion eines Pyrheliometers und eines Aktinometers vom O. Chwolson (Wilds Repertorium für Meteorologie 1893). [See also Weather Bureau Bulletin No. 11, pages 721-725.—EDITOR.]

[4] $\theta_1=\theta'-\theta''=\psi$, etc.—EDITOR.

those of (12), from which the definitive formula (11) was derived. We merely have

$$c\left(1+h\frac{d}{k}\right) \text{ instead of } c.$$

We can therefore present the modified definitive formula in the form:

$$q=K'w;\ K'=\frac{2c}{\sigma}\left(1+h\frac{d}{k}\right);\ w=\frac{1}{t}\frac{\theta_2^2-\theta_1\theta_3}{\theta_1-\theta_3}\ \ldots.(16)$$

where w has the same value as previously, but where the factor K' represents not an instrumental constant but a coefficient of transmission that depends on the properties (d and k) of the glass covering, and besides that on the coefficient of external thermal conductivity, h. Since this last varies with the temperature[5] (and indeed increases), so will also the coefficient of transmission simultaneously increase or decrease in the course of the year or the day. Hence, in a series of frequent measurements the variations in the values of K' will be found to proceed in a definite direction, and in the first approximation may also be assumed proportional to the variations of the intensity of the insolation.

The comparative measurements of radiation can give us most reliably some conclusions as to how great these variations are. In fact, the numerous simultaneous observations taken at the central meteorological station at Warsaw during the period 1901–1905 with the Ångström-Chwolson actinometer and the electrical compensation pyrheliometer show that the results deduced from the theory correspond completely with experience. We have found, on an average, for the four actinometers[6], which were compared for this purpose, the following increases in the coefficients of transmission (which themselves all differ but little from unity); i. e., 0.024, 0.005, 0.02, 0.030, respectively, for an increase of 0.1 gram-calories in the intensity of insolation. This difference in the variations of K' is caused by the fact that the properties (d and k) of the glass covering are not the same for all actinometric thermometers, so that the factor $\left(1+h\frac{d}{k}\right)$, even with the same h, can have different values in different thermometers.

We will not, at this time, go further into these experimental comparisons and numerical results, as they may be easily found in our work[7] recently published. We merely remark that the assumption generally made hitherto of a constant value for K' leads to errors in the values of the radiation thus computed that may increase these values by 10 or more per cent of the quantity in question.

The important result of this present article may be summarized as follows: The effect of the influence of the glass covering in actinometric thermometers demands special attention, and the assumption of the identity of the actual temperature fluctuation with that of the mercurial column alone is not admissible without further investigation.

Especially in the case of the actinometer constructed by Professor Chwolson in 1893, the modified formulas show that the earlier so-called "instrumental constant" can be considered only as a variable coefficient of transmission. The values of the intensity of insolation published up to the present time on the supposition of a so-called "constant" are subject to error, and can not be accepted as absolute values in gram-calories until the older values are computed by means of a variable coefficient of transmission.

Supplementary note.—At the latest International Meteorological Conference, which met at Innsbruck in September, 1905, this proposition among others was adopted, viz, that the measurement of the total radiation from the sun should be carried on regularly as far as possible at meteorological observatories and exclusively with the electrical compensation pyrheliometer. Altho this choice, coming from so authoritative a source, is well founded and should receive careful consideration, yet one should not forget that in actual practise one ought not to neglect the thermometric features of the construction of the actinometer. Especially should the present exclusion of the last-named instrument not be considered as a precedent with regard to the future extension of the use of the simple actinometer.

The object in recommending the electrical compensation method exclusively has been to obtain strictly comparable results from various places. It can not be denied that great mistakes have been made in this respect, and that the measurements heretofore made with various actinometers are not comparable among themselves, and almost all fail to give absolute measures. This result is explained by the fact that the older actinometers had not been sufficiently investigated theoretically and experimentally with reference to the accuracy of their data.

In order to improve this condition of affairs Prof. O. Chwolson, as is well known, undertook in 1892 an extensive investigation of all known types of actinometric construction, and in an extensive work demonstrated the fact that none of these actinometers could stand a severe test.

As he favored the first Ångström method he constructed in 1893 a new actinometer, which was known as the Ångström-Chwolson actinometer, and was used in many continuous measurements. This simple and convenient actinometer was constructed on the basis of exhaustive theoretical studies that from a meteorological standpoint can be considered as altogether ideal.

In the treatise above quoted we have shown that even in this actinometer after long practical use still another modification is necessary. It must, however, be carefully borne in mind that this modification applies only to the method of computing the coefficient of transmission (for the conversion of relative measurements into absolute units), and that otherwise the so-called relative values taken directly from the measurements have suffered no variation.

At the same time, we think that in the extensive treatise recently published, as referred to above, founded on numerous comparisons with the compensation pyrheliometer, we have proved that with the Ångström-Chwolson actinometer one can by continuous measurements probably attain an accuracy as great as 1 per cent. This is a limit of accuracy that at present is altogether satisfactory, and can not be much excelled even with regular pyrheliometric measurements.

There is another circumstance of importance, i. e., that in the case of the Chwolson instrument no variation of the coefficient of transmission has been observed with time; this fact makes it possible to send to distant observers actinometers that have been tested at the central station.

We think, therefore, that it would have been entirely in the best interests of meteorological investigation had the following signification been given to the word "exclusive" as used at the Innsbruck meeting:

"For the regular so-called absolute measures of the total radiation of the sun, the electrical compensation pyrhelio-

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[5] In every actinometric measurement the value of h is considered as constant and the definitive formulas hold good only in such cases.

[6] It is well at this time to state that in the comparisons of the actinometer with the compensation pyrheliometer the difference of the solid angle under which the radiation is received in the two instruments can be considered as a source of certain variations of the coefficient of transmission (and in the same direction as the influence of the glass covering). Also the use of the simplified formulas in computing the intensity of radiation can eventually give rise to certain variations. (See article referred to below.)

[7] Ladislaus Gorczynski. Sur la marche annuelle de l'intensité du rayonnement solaire à Varsovie et sur la théorie des appareils employés, p. 202. (Avec 2 planches.) 8vo. 1906.

meter only can be recommended for the present; all relative measures (i. e., measures taken with the actinometer) should be compared with this pyrheliometer exclusively. As an actinometer for regular use we can for the present recommend the Chwolson instrument".

The requirement that the relative actinometric measures be reduced to the above-named pyrheliometer exclusively implies, of course, that these actinometric values, as a whole, are capable of being thus reduced. The words "for the present" are added, because among pyrheliometers the Ångström compensation method and among actinometers the Chwolson construction naturally can have the exclusive preference only as long as no new instruments, more reliable, simple, and practical, are invented.

REPORT ON THE GREAT INDIAN EARTHQUAKE OF 1905.

By C. F. Marvin, Professor of Meteorology. Dated September 14, 1907.

The above is the title of the latest issue of the Publications of the Earthquake Investigation Committee of Japan in Foreign Languages, Nos. 23 and 24, and comprises the elaborate and detailed report by Dr. F. Omori on the great earthquake which, at an early hour in the morning of April 4, 1905, Greenwich mean time, devastated a large section of northern India. The following is a summary of some of the many valuable points presented in Doctor Omori's report:

Origin.—The epifocal zone formed an elongated tract extending northwest and southeast for a distance of about 170 miles, approximately parallel to the trend of the subHimalayan chains of the Punjab. The geographic coordinates of strongest surface motion are considered to have been about longitude 77° E. and latitude 31° 49′ N. No great surface faulting or dislocation of the ground seems to have occurred or been manifest, and it would therefore appear that the origin of the disturbances must have been deep below the surface.[1] This conclusion is also suggested by a consideration of the wide extent of the region of sensible motion.

Intensity.—The earthquake was felt at an extreme distance of over 1000 miles, and serious damage was effected over a region of about 2150 square miles, an area slightly greater than that of the State of Delaware.

Omori states that "the total number of the houses destroyed in the Kangra district and the Mandi state amounted to 112,477, and the number of persons killed reached 18,815, exceeding any similar record of great seismic catastrophes in recent times"[2].

In connection with the great fatality of the Indian earthquake it is pointed out that the customary type of building within the stricken districts is constructed with walls of mud or rubble masonry, surmounted by heavy slate roofs, and is wholly unsuited to resist seismic action. In fact a massive, thick-walled house of inferior masonry work is shattered down at once by an earthquake shock into a heap of stone, with great loss of life to the inmates; whereas properly built wooden or steel-frame structures can resist almost any shock whatever.

The real measure of the intensity of earthquake action is the maximum acceleration of the vibratory motions of the ground at any place. In the absence of accurate automatic records this can sometimes be deduced approximately from various observed effects, and Omori gives the following values:

Upper Dharmsala: Maximum acceleration not greater than 2300 millimeters per second per second.

Kangra: Maximum acceleration not greater than 3500 millimeters per second per second.

Palampur: Maximum acceleration not greater than 2350 millimeters per second per second.

Mandi: Maximum acceleration not greater than 2280 millimeters per second per second.

In the great Japanese earthquake of 1891 the maximum acceleration in the Mino-Owari plain exceeded 4000 millimeters per second per second, and was much higher in the epicentral zone of the famous Neo Valley. Omori elsewhere states that the maximum acceleration in the San Francisco disturbance probably did not exceed 2600 millimeters per second per second. He also states that the minimum acceleration perceptible to the average individual is about 17 millimeters per second per second. It may be added that the acceleration of gravity at the surface of the earth, exprest in the same units employed above, is about 9800 millimeters per second per second.

Time of origin.—Seismographic records of the Kangra earthquake were not obtained anywhere within the zone of sensible motion. At Dehra Dun, however, about 120 miles southeast of the center of strongest motion, a valuable record for time determination was obtained on a magnetograph. This and similar records at Barrackpore, Kodaikanal, and Taungoo were carefully analyzed by Captain Thomas, in charge of the the magnetic department at Dehra Dun, and after eliminating, as far as possible, clock errors, etc., and allowing for the respective distances from the epicenter, the time of the beginning[3] of the earthquake at the epicenter was adopted by Omori as being 0^h, 49^m, 48^s, Greenwich mean time, April 4, civil reckoning.

Automatic records.—The major part of the report now under consideration is devoted to a detailed analysis and discussion of a large number of automatic records of the earthquake obtained at seismological observatories all over the world.

About 70 seismograms from 51 stations were available. A most valuable feature of the work is the reproduction, in original size, of 41 different seismograms from instruments of greatly varied type. These plates, with short explanatory text, constitute the material of No. 23 of The Publications. Not only are we able from these records to have before us a graphic picture of the earthquake motion at different places all over the world, but we are at the same time able to compare actual records from many different types of seismographs.

Results.—It is now generally known that unfelt earthquake motion as revealed in teleseismic records consists of several more or less sharply defined phases, or sections, and the analysis of the seismograms from this point of view has been carried out by Omori in considerable detail.

The record of an earthquake as it appears upon a seismogram is considered to have been produced at any given station by the arrival of earthquake motions propagated over the short, or minor, arc of the great circle passing thru the station and the origin. This primary motion Omori describes broadly as the W_1 motion, as distinguished from the motion which is propagated from the origin over the major arc of this same great circle, and which therefore must arrive later at the given station from the opposite direction This latter motion Omori calls the W_2 motion. Finally, he recognized a W_3 motion; this is the W_1 which, after passing the station, ultimately returns after completely circumnavigating the globe.

The W_2 and W_3 motions are generally superposed upon the so-called "end portion" or "tail" of the earthquake record, and are seldom sharply defined or clearly differentiated from the other features of the disturbance. Obviously, if a station is at a great distance from the origin, that is, near the antipodes, the motions propagated along the major and minor arcs must be very largely confused and superposed.

The primary motion (W_1) is subdivided by Omori into "first

[1] Probably not over 20 or 30 miles.—*C. F. M.*

[2] Excepting the north Japan earthquake of June 15, 1896, which caused great tidal disturbances along the northeastern coast of Japan, resulting in the death of 21,953 persons.

[3] In the Monthly Weather Review for April, 1907, p. 160, I have given reasons why the time of beginning of strong motion at the origin of an earthquake, and not the beginning of small tremors, should be regarded as the starting point for the discussion of long distance transmission of waves. In the present case we should conclude from the data employed that the strong motion at the epicenter began at about 0^h, 50^m, 08^s, Greenwich mean time.

and second preliminary tremors", "the principal portion", of which five phases, or sections, are recognized, and finally "the end portion".

Omori has deduced the following data for the Indian earthquake diagrams:

(1) The speed of propagation of the initial waves of the several phases of W_1 motion.

(2) The amplitudes and periods of the sustained wave motion and their occurrence and distribution over the different parts of the records of the W_1 motion.

(3) The speeds of propagation and other characteristics of the W_2 wave motion which it is assumed has been propagated along the major arc of the great circle joining a station with the origin of the earthquake.

(4) Finally, the transit velocities, periods of waves, etc., are deduced for the W_3 motion, that is, the motion first recorded after it has circumnavigated the globe.

The most distant station to record the earthquake was the Astronomical Observatory of Mexico at Tacubaya, distant 128° 39′ nearly north of Kangra, or on a great circle passing very nearly thru the pole of the earth; that is to say, in the opposite half of the meridian passing thru the origin.

There is a slight indication that the speed of propagation across the polar and low lying, or suboceanic, regions is a trifle higher than across mountainous Tibet and China to Japan for example; but this indication is offset by the practical identity of the transit velocity to north Germany and Great Britain, across plain regions, as compared with that over the mountainous path to south Austro-Hungary and northern Italy.

The mean transit velocities for the different phases of earthquake motion are summarized from Omori's report, pages 252 and 253, as in Table 1.

TABLE 1.—*Average transit velocities.*

Phase of motion.	Direct method.		Difference method.	
	Velocity.	Limits of epicentral distance.	Velocity.	Limits of epicentral distance.
W_1 motions:	*Km./sec.*	°	*Km./sec.*	°
First preliminary tremor	v_1 =10.52	50-121	v_1 =11.36	28-121
Second preliminary tremor	v_2 = 5.63	40-116	v_2 = 6.46	28-129
First phase, principal portion	v_3 = 4.07	47-129	v_3 = 4.70	39-129
Third phase, principal portion	v_5 = 3.11	39-129	v_5 = 3.28	39-129‡
W_2 motions:				
Commencement, W_2	5.00*			
First maximum, W_2	v_5 = 3.75*			
Principal maximum, W_2	v_5' = 3.34		v_5' = 3.39*	
W_3 motions:				
Principal maximum, W_3	v_5'' = 3.40		v_5'' = 3.40†	

* Propagated over major arc. † Circumnavigated the globe. ‡ Practically independent of distance from epicenter.

NOTE.—Velocities by the direct method are found by dividing the actual distance of a station from the epicenter by the difference in time of occurrence at the origin and the station, and are affected by any errors in location of the origin or in the time of disturbance. The difference method consists in dividing the difference in distance of stations by difference in time of arrival. The stations, in this case, should be approximately in the same lines of propagation.

Distance of origin.—The duration (y in seconds) of the first preliminary tremors recorded at any station is intimately related to the distance (x in kilometers) from the origin, since it represents how much time the fast moving first preliminary tremors gain on the slower moving second preliminary tremors when propagated over a given distance.

The results from 37 seismograph stations are given on page 183 of Omori's report, as in equation 1:

$$x=13.77\ y-576 \qquad (1)$$

The data for 10 earthquakes, all recorded in Japan, give equation 2:

$$x=14.42\ y-148 \qquad (2)$$

The San Francisco quake, recorded at many observatories, gives equation 3:

$$x=16.79\ y-1618 \qquad (3)$$

The Turkestan quake, recorded at a limited number of stations, and accordingly of less weight, gives equation 4:

$$x=11.80\ y-60 \qquad (4)$$

From the weighted mean of equations 1, 2, 3, and 4 Omori obtains equation 5:

$$x=14.28\ y-890 \qquad (5)$$

which may be regarded as generally applicable to miscellaneous stations at a distance of 20° to 140°, while No. 2 is more distinctly applicable to distant earthquakes, recorded at Tokyo.[4]

Omori finds the assumption that the motion is propagated along the chord leads to more complex and irrational results than are tenable.

Seismological apparatus.—Those who desire to know what sort of instruments are most suitable for earthquake observation will be interested in the following remarks by Omori, page 5, Publications of the Earthquake Investigation Committee in Foreign Languages, No. 23.

Function of microseismographs.—No single seismograph can record clearly all the different sets of the vibrations composing the earthquake motion, when the slow component is of a large amplitude. At least two instruments are required for the complete observation of the horizontal (or vertical) motion; the one, with a long oscillation period of 60 seconds or more, recording the slower component, and the other, with a short period of some 15 seconds, recording the quicker component.

To prolong the oscillation period of a horizontal pendulum, the following three conditions are necessary:

(1) The weight of the heavy bob must not be too great, as the point of support must always be kept very sharp.

(2) The length of the strut, or the horizontal distance between the point of support and the steady axis, must not be short.

(3) The height of the pendulum, or the vertical distance between the point of support and the point of suspension, must be made large.

With a horizontal pendulum set up in the "earthquake-proof house", which is 2.65 meters in height and whose strut was one meter in length, the oscillation period was raised to 3 minutes, the weight of the bob being $7\frac{1}{2}$ kilograms.[5] By increasing the height and the length in question the oscillation period can, of course, be more lengthened.

For the observation of the W_2 wave, or the earthquake motion propagated along the major arc between the center of disturbance and a given station, and the W_3 wave, namely the repetition of that first propagated along the minor arc, or the shortest path, the friction of the instrument must be made very small, the oscillation period being made suitably long.

Seismoscope.—Altho the primary object of seismometry is to record correctly or absolutely the earthquake motion, sensitive seismoscopes are also invaluable in the researches on earthquake phenomena, especially in observing, (1), the small movements at the commencement of the first preliminary tremor, and, (2), the feeble vibrations of the W_2 and W_3 waves. The instruments best adapted to these two last-mentioned purposes would be, respectively, a horizontal pendulum of very small mass and of a high magnification, with an oscillation period of 3 or 4 seconds, and a similar one with an oscillation period of about 20 seconds; the registration being in each case made photographically. Instruments of

[4] If the transit velocities v_1 and v_2 in Table 1, in kilometers per second, are reliable, we should have, especially for long distance quakes:

$$y_1=\frac{x}{v_2}-\frac{x}{v_1}=x\left(\frac{v_1-v_2}{v_1\,v_2}\right),$$

from which, by substitution,

$x=12.1\ y$ by the direct method;
$x=15.0\ y$ by the difference method.

Milne gives the rule:

$$x=13\ y_1.$$

Laska's rule is:

$$x=16.67\ y-1000.$$

Angenheister at Göttingen has used the difference in time of arrival (T_1-T_2) of the W_1 and W_2 motion for computing the distance of the origin by a formula of this form:

$$x=\text{semicircle of earth}-(T_1-T_2)\,v,$$

in which v is the velocity of the W_2 motion, as given, for example, in Table 1.

The obvious discordance in these results is doubtless due to difficulties in identifying the several phases of motion and to errors in the assumption that the paths of the several wave motions are approximately proportional to the arcual or angular distances of stations from each other and the origin.

[5] See the Publications, No. 5; subsequently the weight of the bob was increased to 46 kilograms.

Professor Milne's type, with proper improvements, would, in this respect, prove very useful.

For the observation with such seismoscopes as above supposed there is no need for damping the motion of the pendulum, the object being to utilize the proper oscillations of the latter. A high magnification instrument with a large amount of friction fails to record satisfactorily the slow small vibrations.

RECENT ADDITIONS TO THE WEATHER BUREAU LIBRARY.

H. H. KIMBALL, Librarian.

The following titles have been selected from among the books recently received, as representing those most likely to be useful to Weather Bureau officials in their meteorological work and studies. Most of them can be loaned for a limited time to officials and employees who make application for them.

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H. H. KIMBALL, Librarian.

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THE NEW PUBLIC WEATHER SERVICE OF GERMANY.

By Dr. P. Polis, Aachen, Germany.

[Translated from the original by Gustav E. Rausch.]

In the month of July, 1906, there was established, by direction of the Minister of Agriculture, Domains, and Forests, a Public Weather Service. This was first extended to northern Germany, and this year also to southern Germany and Hesse. Northern Germany has been divided into ten districts, in which forecast centers have been established. Proceeding from west to east these centers are located as follows: Aachen, Weilburg on the Lahn, Frankfort on the Main, Hamburg, Magdeburg, Ilmenau in Thüringia, Berlin, Breslau, Bromberg, and Königsberg; in addition there are Dresden for

the kingdom of Saxony, likewise in southern Germany Strasburg for Alsace-Lorraine, Karlsruhe for Baden, Stuttgart for Würtemberg, and Munich for Bavaria, making in all fifteen forecast centers. In the case of the last five mentioned, the weather service centers are combined with the meteorological central offices, whereas in northern Germany, in a good many instances, new centers were established. At Hamburg the center is connected with the Deutsche Seewarte, at Magdeburg with the Wetterwarte of the Magdeburgische Zeitung, at Frankfort with the Physikalische Verein, and at Aachen with the meteorological observatory. In most cases the districts of the weather service stations cover from one to two provinces, viz: Aachen, the Rhine province and Westphalia, as well as the independent Grand-duchy of Luxemburg, where the ducal government has recently established the new service[1]. Weilburg and Frankfort on the Main are weather service centers for Hesse and the province Hesse-Nassau; Ilmenau for the Thüringen states; Hamburg for the provinces of Hanover and Schleswig-Holstein; Magdeburg for the province of Saxony; Berlin for Brandenburg and the Grand-duchy of Mecklenburg; Breslau for Silesia; Bromberg for Pomerania and west Prussia, and Königsberg for east Prussia.

In Germany, for some years past, weather forecasts have been distributed by telegraph from the Weilburg weather service for parts of Hesse-Nassau, and since 1904 from the meteorological observatory at Aachen for the central part of the Rhine province; and further, for one year (1901), there existed an experimental service at Berlin for the province of Brandenburg.

Thru the accommodation of the Deutsche Seewarte the forecast centers receive the so-called collected telegram reports from the meteorological stations thruout Europe, in all about seventy stations. These telegrams are received at the forecast centers from 9:30 to 10:15 a. m. Several of the service centers have telegraphic communication, the observatory at Aachen being one; at other places the forecast center is located with the general post-office. Forecast centers receive in addition direct telegraphic reports of observations from stations in their own service districts, also oftentimes from high stations, such as Monte Rigi in Venn, and Feldberg in Taunus. Other data from meteorological and rainfall stations are transmitted by letter. Finally, the service centers receive, either by telegram or by postal card, the gage readings of the height of water in the important rivers of such districts as include the Rhine, the Weser, the Elbe, the Oder, and the Weichsel.

At the forecast centers a weather map is prepared daily; also the so-called working map in manuscript, as well as auxiliary maps showing distribution of temperature, rainfall, and barometric changes thruout Europe. In addition, there are traced general maps of the condition of the weather in the service district itself. All time data are based on 8 a. m., central European time. The telegraphic reports include pressure, temperature, maximum and minimum temperatures, direction and velocity of wind, as well as condition of the weather within the past twenty-four hours. These reports are telegraphed by the use of a cipher code, which is essentially founded upon the relative value of the meteorological elements. Take, for instance, the telegram of May 29, 1906, 8 a. m., "61522 33172 01810". This means that at Berlin the pressure (reduced to sea level and to latitude 45°) was 761.5 mm., west-southwest wind prevailed of velocity 3 (light), the sky was three-fourths obscured (cloudy), the temperature was 17.2° C., there was 1 mm. of precipitation within the past twenty-four hours, and the weather condition was showery the past twenty-four hours.

The working map is completed at about 10:30 a. m. The weather map contains a review of the weather conditions, particular consideration being given to meteorological conditions in the service district in which the station is located. Beneath the map appears the weather forecast, also directions for the use of the weather map, and the telegraphic reports of local observations at the stations in the service district. According to the meteorological conditions, separate forecasts are made at the forecast centers for different parts of their districts. The service districts have for this purpose been divided into subdistricts, according to the topographical and climatic conditions of the country. Forecasts are made and distributed only at forecast centers. Owing to the diversified condition of the country and its climate the Aachen service has the greatest number of subdistricts, viz, twelve. It may be worth mentioning, as an example of the climatic contrasts, that, within a distance of 50 kilometers, the difference in the normal precipitation may range upward of 700 millimeters; for instance, the normal precipitation per annum at Monte Rigi, in Venn, is 1305 mm., while at Euskirchen it is only 546 mm.

At 11 o'clock the forecast is delivered by the service station to the telegraph office, whence it is disseminated by telegraph. Every post-office, even the smallest in the rural districts, receives the weather telegram, and the text of the forecast is posted on the outside of the building for the benefit of the public. This is completed by 12 o'clock, noon. The forecasts have by this time been posted at more than twenty thousand public places in northern Germany. Forecasts are made for the following thirty-six hours. Information as to the probable condition of the weather for the day can also be furnished.

The transmission of the weather forecasts by telegraph is by the use of a word code, which consisted last year of two key words and this year of three key words. For an illustration take the following:

Forecast:	*To-morrow rain followed by*	*dry weather and generally clear.*
Number:	*03*	*01*
Telegram:	$\underbrace{\qquad\qquad}$ *Ebene*	

windy;	*colder.*	*Probably an early change in weather.*
04	*23*	*04*
Lama	$\underbrace{\qquad\qquad}$ *Polster*	

In addition, at the forecast centers copies of the weather map are being prepared. This is accomplished by a printing process with the use of a Roneo or cyclostyle apparatus. The process differs from that in use in America in that the whole text, statistics, and even the weather map itself, are written and drawn upon a wax map. The apparatus contains a roller, which has to be saturated with ink, the motive power for the apparatus being, as a rule, derived from an electric motor; it delivers something like forty finished weather maps a minute. As a rule the printing of the weather map commences at 10:45 a. m., when the maps are immediately wrapt and mailed, so they can be displayed the same day. At 12 o'clock this work is finished.

Attached to the service station at Aachen is a substation, which is located at Bonn on the Rhine, where weather maps are issued, no forecast being prepared at this place. The substation at Bonn is in telephonic communication with the Aachen observatory every morning and receives the forecasts by telephone.

The issue of the weather map in Germany is a large one; for instance, at the Aachen station 1500 are issued daily. The distribution is effected exclusively by mail, the cost of each, including delivery, being 50 pfennigs a month. In all

[1] In fact the meteorological system was organized in Luxemburg only in 1907 by the writer of this article.

about 12,000 weather maps are issued daily at the various service stations thruout Germany.

During the winter season (October to April, inclusive) weather forecasts are not given the same wide distribution as in summer; they are only published in the newspapers and on the weather maps.

For the purpose of verifying forecasts, suitable persons (observers at meteorological stations, directors of schools, etc.) are appointed in every service district to keep a record of the occurrences of weather conditions and to remark upon the verification of the forecasts. Their reports are sent in weekly. The Aachen service station has cooperating observers at approximately 115 places. The final verifications are made at the different forecast centers.

For educational purposes directors of the service and their assistants give lectures on meteorology for the benefit of agricultural and other societies.

It is a difficult matter to make a weather forecast in Europe, especially so in Germany, as the movements of the areas of low and high pressure are quite complicated. The constant formation of separate low pressure areas and the variety of climatic conditions add to the difficulty of making precise weather predictions. In addition low pressure areas appear suddenly on the British coast, influencing with extraordinary rapidity the weather conditions in western and central Europe. The conditions for the weather service of the United States are much more favorable, for, on account of the absence of a mountain range running from west to east, areas of uniform weather are large, and besides the paths of the areas of low and high pressure are considerably more regular. Since all lows and highs come from the west and can be recognized at a distance of thousands of kilometers, and in passing from the Pacific to the Atlantic occupy several days, therefore it is possible to make forecasts for a longer period than in Europe, namely, forty-eight hours.

THE WEATHER OF THE MONTH.

By Mr. P. C. DAY, Assistant Chief, Division of Meteorological Records.

PRESSURE.

The distribution of mean atmospheric pressure for August, 1907, over the United States and Canada, is graphically shown on Chart VI, and the average values and departures from the normal are shown for each station in Tables I and V.

Under normal conditions the atmospheric pressure increases during August from that of July over the entire northern half of the United States, and apparently the whole of Canada, from the Rocky Mountains eastward to the Atlantic, with the maximum increase, more than .05 inch, over the lower St. Lawrence Valley.

Over the South Atlantic and Gulf States August marks the advent of the West Indian hurricane season, and the occasional passage of these storms westward and northeastward over the districts mentioned tends to lower the average pressure from that of July, the decrease over the Florida Peninsula, Cuba, and adjacent regions amounting to as much as .05 inch. On the north Pacific coast the beginning of the rainy season is indicated by diminishing pressure from that of July, with the maximum decrease, about .05 inch, along the immediate coasts of Washington and Oregon.

During August, 1907, the average pressure increased over that of July in all portions of the United States and Canada, except the upper Missouri Valley and adjoining Canadian districts and a small area embracing the coast district of northern California. Over the eastern districts of the United States and Canada the increase was quite marked, ranging from .10 to .15 inch, while over the coast districts of Washington the increase was from .05 to .08 inch.

Along the northern portions of Montana and North Dakota and the adjoining Canadian Provinces of Alberta and Saskatchewan, the pressure decreased from that of July by amounts from .05 to .07 inch.

Pressure was decidedly above normal over the north Pacific coast, the lower Mississippi Valley, and the Gulf and south Atlantic coasts. Over the northern portion of the United States and the Canadian Provinces east of the Rocky Mountains, except the peninsula of Ontario, the pressure averaged from .03 to .07 inch below normal.

Pressure averaged 30.05 inches, or above, over the Florida Peninsula, the central portion of the Appalachian region, and along the coasts of Washington and Oregon; and 29.85, or lower, over the Canadian Northwest Provinces, southeastern California, and the southern portions of Arizona and New Mexico.

The high pressure extending from the west Gulf coast northeastward over the South Atlantic States, with more than the usual decrease in pressure northward, augmented somewhat the force and persistency of the southerly winds normal to the season in the districts east of the Rocky Mountains. Over the northern half of the above district, as far eastward as the Great Lakes, the wind movement ranged from 10 to 30 per cent above the seasonal average. Southerly surface winds prevailed over nearly all districts east of the Rocky Mountains, while over the Plateau and Pacific coast districts the winds were generally from some westerly point.

TEMPERATURE.

The month was colder than the average over the entire northern half of the United States and the whole of Canada as far as observations extend, except a small area near the Gulf of St. Lawrence, where a small excess of temperature was noted. Over the central and northern portions of the Rocky Mountain and Plateau districts, the monthly averages were nearly 5° below the normal, making the fifth consecutive month during which the mean temperature has been continuously below the average in those districts. Over the Lake region, Middle Atlantic States, and New England the temperature averaged from 2° to more than 4° below the normal, and was likewise the fifth consecutive month with mean temperature below the seasonal average.

Temperatures above the average were recorded over the whole of the cotton-growing States, with the maximum excess over western Texas, where the average for the month exceeded the normal by nearly 5°.

Abnormally warm weather occurred over most of Texas, Arkansas, southwestern Missouri, Kansas, and Oklahoma during the second week of the month. From the 10th to the 12th the maximum temperatures over Arkansas, and the adjoining districts of Missouri, Kansas, Oklahoma, Texas, Louisiana, and Mississippi, ranged from 100° to 110°, and were in many cases, especially over Arkansas, the highest ever recorded. High temperatures again prevailed in the above districts near the end of the month. Maximum temperatures slightly above 100° were recorded in the valley of the Columbia River and over the plains of eastern Washington and Oregon and the lower elevations of Idaho on the first day of the month. Over central and southeastern California and the southern portion of Arizona maximum temperatures from 100° to 110° and over were recorded, but these readings were not unusual for the region and season.

Minimum temperatures of 32° or lower occurred in the mountain districts from northern Arizona and New Mexico northward, and over the northern portion of the States along the boundary from the Rocky Mountains to New England, accompanied by light to heavy frosts, but without serious injury to vegetation.

PRECIPITATION.

The distribution of precipitation during August, 1907, is graphically shown on Chart IV by appropriate shading or by figures representing the actual amount of fall.

Generous and well-distributed amounts of precipitation occurred over most of the Mississippi Valley region, in western Kansas and Oklahoma, the Texas panhandle, New Mexico and Arizona, and generally over the northern Rocky Mountain districts, with local heavy falls in portions of eastern North Carolina, western Florida, and southern Alabama. Over most of the middle and upper Mississippi Valley the heavy rainfall of July was repeated in August, giving ample moisture to the soil and resulting in some damage locally from the excessive amount of fall.

Generally heavy precipitation occurred over the panhandle of Texas, central and southern Kansas, and western Oklahoma. In the panhandle, however, the occurrence was confined to two periods, the 2d and 3d, and 20th to 22d, practically all the rain for the month falling on those dates.

Over New Mexico and Arizona the seasonal summer rains continued and fell in amounts sufficient for practically all needs, adding large volumes to reservoirs and maintaining the streams of the Territories at satisfactory stages. Over most of Idaho and portions of western Montana the month was the wettest August on record.

A marked deficiency in precipitation occurred over the lower Lake region, New York and New England, and generally over the South Atlantic and Gulf States. Over northern New York and portions of southern New England the precipitation was the least recorded in August in many years, and following a marked deficiency in July caused a drought of considerable proportions, especially over eastern Massachusetts and Rhode Island. Over the southern Appalachian region drought conditions inaugurated in July continued in August, resulting in a decided lack of moisture, but frequent light showers appear to have prevented serious damage to vegetation.

Rainfall was generally light over the cotton-growing States, as also over the greater part of the Missouri Valley and the Plains region from Nebraska northward, but light showers at rather frequent intervals maintained a sufficient supply of moisture for the needs of the season. Over most of the mountain and Plateau districts the precipitation was considerably above the normal, occurring mostly in light falls well distributed during the various periods of the month.

Some local heavy rains were reported from northern California, but the greater part of that State was without appreciable precipitation.

HUMIDITY AND SUNSHINE.

Relative humidity from 5 to 15 per cent in excess of the average prevailed over the entire Rocky Mountain and Plateau districts and generally over the middle Mississippi Valley.

There was a marked deficiency over central Texas and the New England States, and it was generally deficient over New York and the interior of the South Atlantic States.

A general excess of cloudy weather prevailed from the Mississippi Valley westward to the Pacific, excepting portions of the Missouri Valley, southwestern Missouri, Arkansas, and the greater part of Texas, where there was a general excess of sunshine. Generally abundant sunshine occurred over the cotton-growing States and from the lower Lakes northeastward over New England.

WEATHER IN ALASKA.

Reports from Alaska indicate the continuance of seasonable weather. The usual number of cloudy, rainy days appear to have prevailed over the coast districts, and fair weather with occasional light showers and but little wind movement characterized the weather of the interior portions of the Territory.

The temperature readings made at 9 a. m. daily at a large number of points in the interior show temperatures at that hour ranging generally from 45° to 65°, with small variations from day to day, and but few points reported readings as low as freezing.

Average temperatures and departures from the normal.

Districts	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	12	65.7	− 1.7	−20.7	− 2.6
Middle Atlantic	16	71.6	− 1.2	−13.6	− 1.7
South Atlantic	10	78.6	+ 0.8	+ 5.0	+ 0.6
Florida Peninsula*	8	81.8	+ 0.5	+11.3	+ 1.4
East Gulf	11	80.8	+ 1.5	+14.5	+ 1.8
West Gulf	10	83.3	+ 2.5	+16.6	+ 2.1
Ohio Valley and Tennessee	13	74.3	− 0.6	− 3.5	− 0.4
Lower Lake	10	67.0	− 2.5	−17.8	− 2.2
Upper Lake	12	64.4	− 1.6	−12.3	− 1.5
North Dakota*	9	65.3	− 1.2	−22.4	− 2.8
Upper Mississippi Valley	15	71.9	− 1.1	− 8.0	− 1.0
Missouri Valley	12	74.4	+ 0.6	− 2.6	− 0.3
Northern Slope	9	63.6	− 2.8	−10.9	− 1.4
Middle Slope	6	76.9	+ 1.6	+ 9.1	+ 1.1
Southern Slope*	7	81.8	+ 2.6	+16.2	+ 2.0
Southern Plateau*	12	76.3	− 1.0	+ 0.5	+ 0.1
Middle Plateau*	10	66.8	− 3.1	+ 5.8	+ 0.7
Northern Plateau*	12	63.5	− 4.4	− 7.2	− 0.9
North Pacific	7	59.6	− 1.4	− 1.9	− 0.2
Middle Pacific	8	65.8	− 0.9	− 2.2	− 0.3
South Pacific	4	69.4	− 1.1	+ 4.1	+ 0.5

* Regular Weather Bureau and selected cooperative stations.

In Canada.—Director R. F. Stupart says:

The temperature was just the average in a few isolated localities, chiefly in Manitoba and eastern Quebec; otherwise thruout the Dominion it was below the average, the negative departure varying from 1° to 3°, except in Alberta, where it was 5°, and in northern British Columbia 7°.

Average precipitation and departures from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		*Inches.*	*Inches.*
New England	12	1.40	37	−2.4	−6.9
Middle Atlantic	16	3.17	71	−1.3	−5.2
South Atlantic	10	5.01	82	−1.1	−9.4
Florida Peninsula*	8	4.91	71	−2.0	−7.0
East Gulf	11	3.66	75	−1.2	−3.9
West Gulf	10	1.13	37	−1.9	−7.1
Ohio Valley and Tennessee	13	3.01	88	−0.4	−2.4
Lower Lake	10	1.25	41	−1.8	−3.0
Upper Lake	12	2.99	100	0.0	−2.1
North Dakota*	9	1.98	111	+0.2	−1.2
Upper Mississippi Valley	15	5.31	171	+2.2	+2.8
Missouri Valley	12	2.61	77	−0.8	−1.4
Northern Slope	9	1.26	109	+0.1	+1.2
Middle Slope	6	2.24	92	−0.2	−2.0
Southern Slope*	7	2.63	118	+0.4	−0.2
Southern Plateau*	12	2.20	169	+0.9	+2.6
Middle Plateau*	10	1.54	208	+0.8	+2.5
Northern Plateau*	12	1.67	192	+0.8	+1.9
North Pacific	7	0.99	125	+0.2	−7.1
Middle Pacific	8	0.45	900	+0.4	+3.3
South Pacific	4	T.	100	0.0	+1.7

* Regular Weather Bureau and selected cooperative stations.

In Canada.—Director Stupart says:

In the southern portions of Vancouver Island and on the lower mainland the rainfall was very light, less than half the average amount in many localities. In other parts of British Columbia it was nearly everywhere much in excess of the average, Cariboo recording nearly three times the usual quantity. In the Western Provinces and east as far as Lake Superior, with the exception of a few localities in southern Alberta, the rainfall was also remarkably heavy, the positive departures being equivalent to over 100 per cent at Edmonton, Swift Current, and Regina; to 52 per cent at Prince Albert, 57 per cent at Minnedosa, and 89 per cent at Port Arthur. The peninsula of Ontario and the Ottawa and upper St. Lawrence valleys, on the other hand, suffered from the lack of rain, the drought being severely felt in nearly all districts, the deficiency of rainfall varying from 50 to 76 per cent. In the western portion of the Province of Quebec the rainfall was also exceedingly light, but eastward it increased steadily, reaching the average amount a little below Quebec and exceeding it by from 18 to 28 per cent in the Gaspe Peninsula; much rain also fell over the Maritime Provinces, the excess from the usual quantity varying from 3 per cent in Prince Edward Island to 36 and 38 per cent in parts of Nova Scotia.

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
	%			%	
New England	76	− 6	Missouri Valley	66	− 1
Middle Atlantic	74	− 2	Northern Slope	59	+ 7
South Atlantic	82	0	Middle Slope	62	+ 3
Florida Peninsula	78	− 2	Southern Slope	61	− 3
East Gulf	80	0	Southern Plateau	50	+ 5
West Gulf	73	− 2	Middle Plateau	44	+10
Ohio Valley and Tennessee	75	+ 3	Northern Plateau	45	+ 3
Lower Lake	70	− 1	North Pacific	76	+ 1
Upper Lake	75	0	Middle Pacific	64	+ 1
North Dakota	67	+ 3	South Pacific	66	+ 1
Upper Mississippi Valley	77	+ 7			

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	4.9	− 0.1	Missouri Valley	4.0	− 0.1
Middle Atlantic	5.0	0.0	Northern Slope	4.0	+ 0.3
South Atlantic	4.8	− 0.4	Middle Slope	4.6	+ 0.8
Florida Peninsula	4.0	− 1.2	Southern Slope	3.7	− 1.1
East Gulf	5.1	+ 0.2	Southern Plateau	3.6	+ 0.2
West Gulf	3.7	− 0.7	Middle Plateau	3.9	+ 1.7
Ohio Valley and Tennessee	5.2	+ 0.7	Northern Plateau	3.6	+ 0.6
Lower Lake	4.4	− 0.1	North Pacific	5.6	+ 1.7
Upper Lake	4.8	0.0	Middle Pacific	4.0	+ 1.2
North Dakota	4.6	+ 0.7	South Pacific	2.6	+ 0.1
Upper Mississippi Valley	4.6	+ 0.5			

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Amarillo, Tex.	30	50	s.	Peoria, Ill.	6	58	n.
Birmingham, Ala.	13	58	ne.	Point Reyes Light, Cal.	9	60	nw.
Devils Lake, N. Dak.	8	52	w.	Do.	25	56	nw.
La Crosse, Wis.	11	50	nw.	Do.	26	51	nw.
Marquette, Mich.	18	58	sw.	Salt Lake City, Utah	3	64	w.
Minneapolis, Minn.	18	62	w.	Sand Key, Fla.	16	50	se.
Mount Tamalpais, Cal.	9	60	nw.	Sioux City, Iowa	7	55	se.
North Head, Wash.	6	54	se.	Williston, N. Dak.	10	50	n.
Oklahoma, Okla.	22	54	s.				

CLIMATOLOGICAL SUMMARY.

By Mr. James Berry, Chief of the Climatological Division.

TEMPERATURE AND PRECIPITATION BY SECTIONS, AUGUST, 1907.

In the following table are given, for the various sections of the Climatological Service of the Weather Bureau, the average temperature and rainfall, the stations reporting the highest and lowest temperatures with dates of occurrence, the stations reporting greatest and least monthly precipitation, and other data, as indicated by the several headings.

The mean temperatures for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperature and precipitation are based only on records from stations that have ten or more years of observation. Of course the number of such records is smaller than the total number of stations.

Section.	Temperature—in degrees Fahrenheit.								Precipitation—in inches and hundredths.					
	Section average.	Departure from the normal.	Monthly extremes.						Section average.	Departure from the normal.	Greatest monthly.		Least monthly.	
			Station.	Highest.	Date.	Station.	Lowest.	Date.			Station.	Amount.	Station.	Amount.
Alabama	80.4	+ 1.2	Boligee Pushmataha	104 104	31 31	Anniston	53	26	3.50	— 1.22	Mobile	9.33	Tuskegee	1.00
Arizona	79.4	— 1.1	Casagrande	120	4	Flagstaff (a)	34	31	3.08	+ 0.91	San Carlos	9.80	3 stations	0.00
Arkansas	82.0	+ 2.7	Heber	113	10	3 stations	54	4,22	2.92	— 0.30	Pocahontas	8.52	Fort Smith	0.52
California	71.0	— 1.8	Mammoth Tank	118	29	Summit	21	28	0.11	+ 0.03	Edgewood	2.86	Many stations	0.00
Colorado	64.8	— 0.6	Las Animas	106	9,10	Lay	26	11	1.95	+ 0.07	Akron	5.13	Canon City	0.17
Florida	81.4	— 0.1	Molino Wausau	101 101	28 31	3 stations	62	3 dates	5.97	— 1.56	Apalachicola	12.20	Key West	2.16
Georgia	79.5	+ 0.4	Hawkinsville	105	8	Diamond	52	26	4.10	— 1.39	Albany	11.34	Carrollton	0.80
Hawaii	74.7†		2 stations	95	3 dates	Waimea, Hawaii	50	4 dates	15.13‡		Honomanu Valley, Maui.	58.96	U. S. Magnetic Station, Oahu.	0.10
Idaho	62.5	— 3.4	Garnet	113	6	Forney Chesterfield	22 22	19 20	1.26	+ 0.85	Idaho Falls	4.09	Caldwell	0.08
Illinois	72.9	— 0.8	Chester Cisne	102 102	31 31	La Grange	41	22	5.46	+ 2.13	Loami	8.84	Hoopeston	2.08
Indiana	71.8	— 1.3	Marengo Mount Vernon	100 100	7 31	Auburn	40	22	3.83	+ 0.91	Mount Vernon	10.18	Bluffton	2.01
Iowa	71.1	— 0.8	Ottumwa	99	31	Osage	37	13	4.33	+ 0.57	Delaware	9.67	Rock Rapids	1.05
Kansas	78.1	+ 0.9	Alton Phillipsburg	109 109	10 10	Hays	45	11,19	3.26	+ 0.09	Sedan	6.75	Ulysses	1.24
Kentucky	74.8	— 1.4	3 stations	99	3 dates	St. John	48	4	4.27	+ 0.85	Irvington	7.56	Lexington	2.07
Louisiana	82.8	+ 1.3	Alexandria Plain Dealing	105 105	10 12	Collinston	61	26	4.66	— 0.40	Pearl River	10.11	Robeline	0.44
Maryland and Delaware	71.5	— 2.1	Denton, Md Milford, Del	95 95	8 8	Oakland, Md	39	5	4.26	+ 0.05	Porto Bello, Md	9.50	Sudlersville, Md	1.68
Michigan	64.7	— 1.5	4 stations	96	4 dates	Wetmore	27	7,21	2.15	— 0.68	Thomaston	5.22	Durand	0.36
Minnesota	66.2	— 0.7	Milaca	98	31	Beardsley	23	19	4.11	+ 0.87	Caledonia	12.17	Morris	1.00
Mississippi	81.7	+ 1.6	Aberdeen	106	31	Ripley Duck Hill	60 60	4 26	3.63	— 0.93	McNeill	10.48	Bellefontaine	0.41
Missouri	77.3	+ 1.1	Dean	109	11	Ironton Louisiana	47 47	4 22	3.71	— 0.17	Steffenville	7.07	Koshkonong	1.56
Montana	61.2	— 3.3	Fallon	101	9	Grayling	19	20	1.68	+ 0.80	Snowshoe	5.05	Decker	T.
Nebraska	73.1	— 0.3	Beaver City	112	10	3 stations	38	20	2.34	— 0.49	Columbus	6.19	Kirkwood	0.36
Nevada	67.7	— 2.1	Las Vegas	109	13	Dyer	22	10	0.31	— 0.29	Fenelon	1.35	4 stations	0.00
New England*	64.6	— 1.6	Chestnut Hill, Mass.	99	12	Grafton, N. H.	33	30	1.66	— 2.42	Patten, Me	5.00	Lawrence, Mass	0.66
New Jersey	70.5	— 1.9	Friesburg	96	8	Layton River Vale	39 39	15,30 30	3.45	— 1.31	Rancocas	7.61	New Brunswick	1.79
New Mexico	70.9	— 0.7	Deming	109	15	Winsors	36	4,5	4.10	+ 1.92	Rosedale	8.10	Cambray	0.60
New York	65.7	— 1.6	Chatham	99	12	Indian Lake	25	22	1.58	— 2.43	Salisbury	4.49	Palermo	0.33
North Carolina	75.8	— 0.4	4 stations	98	4 dates	Sapphire	43	4	4.39	— 1.57	New Bern	12.21	Settle	1.41
North Dakota	64.5	— 1.1	Edgeley	104	10	Plaza	26	20,21	1.89	— 0.01	Amenia	6.59	New England	0.20
Ohio	69.5	— 2.2	Waverly	96	12	Norwalk	40	22	2.48	— 0.50	Ironton	7.10	Rittman	0.80
Oklahoma and Indian Territories.	82.5	+ 2.0	Chandler, Okla Muskogee, Ind. T.	109 109	11 11	Gage, Okla	52	20	2.68	— 0.91	Gage, Okla	8.44	Meeker, Okla	0.80
Oregon	62.7	— 2.6	Huntington	115	2	Silver Lake	21	27	1.15	+ 0.66	Bull Run	3.27	3 stations	T.
Pennsylvania	68.0	— 2.1	Milford	97	12	Pocono Lake	32	15	2.94	— 1.48	Irwin	6.19	Le Roy	0.77
Porto Rico	78.5		Central Aguirre Caguas	97 97	4 22,23	Cayey Aibonito	58 58	9 27	5.72		Añasco	20.70	Santa Isabel	0.71
South Carolina	79.4	— 0.1	3 stations	101	31	Walhalla	54	4,5	5.41	— 0.12	Effingham	11.40	Florence	2.06
South Dakota	69.8	— 0.5	Pierre	107	9	Frederick	30	20	0.90	— 1.87	Roslyn	4.30	Marion	T.
Tennessee	77.3	+ 0.8	Dover	103	31	Erasmus	43	4,26	3.15	— 0.88	Silver Lake	6.65	Memphis	0.49
Texas	83.9	+ 1.5	Graham Henrietta	110 110	3 d'ts 10	Dalhart	50	12,20	1.81	— 0.84	Lone Star Ranch	9.49	7 stations	0.00
Utah	67.7	— 1.9	Wellington	121	22	Lucin Woodruff	26 26	11,12 11,19	1.56	+ 0.85	Torrey	3.94	Garrison	0.05
Virginia	72.4	— 1.8	Warsaw	95	8	Burkes Garden	39	4,26	4.10	— 0.40	Warsaw	8.36	Wytheville	1.49
Washington	63.1	— 3.1	Zindel	109	1	Colville Northport	30 30	26 19	1.39	+ 0.46	Colville	3.88	Twisp	0.08
West Virginia	69.4	— 3.1	3 stations	93	12	Bayard Beckley	41 41	5 26	4.64	+ 0.87	Bancroft	10.12	Wellsburg	1.55
Wisconsin	65.7	— 2.1	Osceola Racine	95 95	31 31	Koepenick Prentice	33 33	4 4	4.15	+ 0.93	Valley Junction	7.40	Koepenick	1.70
Wyoming	61.4	— 1.8	Moorcroft	104	9	3 stations	18	3 dates	1.12	+ 0.28	Bedford	2.96	Sheridan (2)	T.

* Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut. † 48 stations, with an average elevation of 618 feet. ‡ 139 stations.

DESCRIPTION OF TABLES AND CHARTS.

By Mr. P. C. Day, Assistant Chief, Division of Meteorological Records.

For description of tables and charts see page 30 of Review for January, 1907.

TABLE I.—*Climatological data for U. S. Weather Bureau stations, August, 1907.*

Stations.	Elevation of instruments.			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.									Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.			Wind.					Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness during daylight, tenths.	Total snowfall.
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hrs.	Departure from normal.	Mean max. + mean min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.				Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity: Miles per hour.	Maximum velocity: Direction.	Maximum velocity: Date.					
New England.							**65.7**	**− 1.7**										**76**	**1.40**	**− 2.4**										**4.9**	
Eastport	76	69	85	29.85	29.93	− .03	59.0	− 0.7	82	11	67	47	28	51	29	54	52	82	2.43	− 0.8	10	5,919	s.	30	nw.	4	4	17	10	6.3	
Portland, Me.	103	81	117	29.85	29.97	− .01	64.6	− 1.6	88	12	72	50	20	57	28	58	54	73	2.07	− 1.5	8	5,832	s.	27	s.	24	15	8	8	4.6	
Concord	288	70	79	29.67	29.97	− .01	65.1	− 1.5	92	12	76	42	19	54	39	...	...	...	1.64	− 2.1	10	3,320	nw.	20	w.	13	21	8	2	2.5	
Burlington	404	12	47	29.56	29.99	+ .02	63.6	− 5.1	89	11	73	42	19	54	34	...	...	...	1.05	− 3.0	12	7,159	s.	38	s.	17	8	12	11	5.7	
Northfield	876	16	70	29.06	30.00	+ .02	60.0	− 2.9	87	11	72	35	19	48	41	57	55	83	1.47	− 2.5	12	5,174	sw.	28	s.	24	8	13	10	5.9	
Boston	125	115	188	29.86	29.99	.00	69.6	+ 0.7	94	12	78	54	29	62	30	62	58	70	1.10	− 2.9	9	6,929	sw.	24	nw.	26	14	11	6	4.6	
Nantucket	12	14	90	29.98	29.99	.00	66.2	− 1.8	78	7	72	54	23	60	16	62	60	84	1.76	− 1.3	10	8,799	sw.	35	n.	4	9	12	10	6.1	
Block Island	26	11	46	29.98	30.01	+ .02	67.4	− 1.3	83	8	74	56	30	61	18	62	60	83	1.28	− 2.2	8	8,410	sw.	32	nw.	4	8	18	5	4.5	
Narragansett	...	9	...	...	...	...	66.2	− 2.3	88	13	76	46	27	57	31	...	...	...	0.94	− 2.3	8	...	sw.	...	...	...	24	3	4	...	
Providence	160	57	67	29.83	30.00	+ .01	68.4	− 2.6	87	8	78	51	19	59	30	61	57	72	0.88	− 3.2	9	4,078	w.	18	nw.	26	13	12	6	4.3	
Hartford	159	122	132	29.83	30.00	+ .01	69.1	+ 0.2	94	12	79	49	30	59	31	61	56	68	1.03	− 3.5	5	4,615	s.	23	s.	2	6	17	8	5.3	
New Haven	106	116	155	29.89	30.00	+ .01	69.3	− 0.8	89	8	78	51	30	60	23	62	58	72	1.21	− 3.8	6	5,639	s.	24	nw.	14	16	10	5	4.1	
Mid. Atlantic States.							**71.6**	**− 1.2**										**74**	**3.17**	**− 1.3**										**5.0**	
Albany	97	102	115	29.90	30.00	+ .02	69.1	− 0.4	95	12	80	50	23	59	31	61	56	67	0.74	− 3.2	11	5,106	s.	26	s.	16	10	15	6	5.0	
Binghamton	875	78	90	29.11	30.02	+ .03	65.0	− 2.5	93	12	77	40	19	53	43	...	...	...	0.98	− 2.4	8	3,829	nw.	26	nw.	13	9	12	10	5.6	
New York	314	108	350	29.67	30.00	.00	72.0	− 0.2	91	8	79	59	29	65	21	64	59	68	2.48	− 2.0	10	6,766	s.	28	nw.	14	10	16	5	4.8	
Harrisburg	374	94	104	29.63	30.02	+ .01	71.4	− 0.7	90	8	80	55	23	63	24	63	59	68	2.59	− 1.7	10	4,088	nw.	21	sw.	2	11	12	8	5.0	
Philadelphia	117	116	184	29.90	30.02	+ .02	73.4	− 0.4	90	7	81	61	29	66	20	65	61	70	3.59	− 1.0	16	6,231	nw.	27	n.	31	6	16	9	6.0	
Scranton	805	111	119	29.17	30.02	+ .02	67.4	− 1.9	91	12	78	46	30	56	35	60	55	68	1.82	− 2.4	12	4,456	ne.	25	sw.	2	11	14	6	4.7	
Atlantic City	52	37	48	29.97	30.02	+ .02	71.2	− 1.4	86	13	77	58	30	66	18	66	63	79	3.97	− 0.3	14	4,921	sw.	19	se.	23	6	17	8	5.7	
Cape May	17	48	52	30.02	30.04	+ .04	70.8	− 2.6	86	8	76	56	15	66	18	67	...	...	5.83	+ 1.6	14	4,906	s.	20	ne.	9	10	17	4	4.7	
Baltimore	123	69	117	29.88	30.01	.00	73.6	− 1.1	91	8	82	58	23	65	23	66	62	72	4.60	+ 0.4	13	4,244	n.	32	nw.	9	6	13	12	5.6	
Washington	112	59	76	29.90	30.02	+ .01	72.4	− 2.1	91	8	81	55	26	63	26	67	64	79	4.34	− 0.1	12	3,804	nw.	33	nw.	6	11	11	9	5.4	
Cape Henry	18	11	58	30.00	30.02	+ .02	76.2	− 0.7	92	13	83	62	30	70	19	...	...	...	2.71	− 3.4	9	7,615	sw.	46	nw.	4	12	12	7	4.8	
Lynchburg	681	83	88	29.31	30.04	+ .02	74.0	− 0.8	93	8	84	55	26	64	28	68	66	81	3.21	− 1.0	13	2,254	ne.	27	nw.	13	10	16	5	5.4	
Mount Weather	1,725	10	57	28.25	30.02	+ .01	68.0	− 1.4	84	8	75	52	4	61	20	62	59	78	3.18	− 0.4	14	8,451	nw.	32	nw.	25	19	7	5	3.4	
Norfolk	91	102	111	29.93	30.02	+ .02	76.9	+ 0.2	92	8	84	65	4	70	21	70	67	79	3.89	− 2.1	11	5,214	s.	29	sw.	3	9	16	6	5.1	
Richmond	144	145	153	29.88	30.03	+ .02	75.4	− 2.1	93	13	84	58	4	66	25	...	...	...	5.31	+ 0.9	12	4,774	n.	30	nw.	9	10	16	5	4.8	
Wytheville	2,293	40	47	27.72	30.04	+ .03	69.6	− 0.9	86	14	80	48	27	59	30	64	62	85	1.49	− 3.0	17	2,891	w.	20	nw.	7	15	13	3	4.1	
S. Atlantic States.							**78.6**	**+ 0.8**										**82**	**5.01**	**− 1.1**										**4.8**	
Asheville	2,255	53	75	27.76	30.04	+ .02	71.1	+ 0.6	87	7	81	49	4	61	29	65	63	84	2.84	− 2.0	15	3,626	se.	27	n.	16	4	20	7	6.0	
Charlotte	773	68	76	29.22	30.04	+ .02	77.2	+ 0.6	92	8	86	60	4	68	24	69	67	77	1.84	− 3.7	11	3,676	ne.	20	w.	28	4	8	9	6.2	
Hatteras	11	12	47	30.02	30.03	+ .03	77.8	− 0.4	88	28	83	66	3	73	16	73	72	85	7.96	+ 2.1	11	8,202	sw.	38	nw.	3	21	9	1	2.9	
Raleigh	376	71	79	29.63	30.02	+ .01	77.1	+ 0.3	93	1	87	60	4	68	26	70	67	79	2.96	− 2.9	11	3,683	sw.	31	se.	2	13	13	5	4.5	
Wilmington	78	81	91	29.95	30.03	+ .03	78.8	+ 1.2	94	8	86	65	5	71	22	73	72	86	10.17	+ 3.7	15	4,446	sw.	38	nw.	29	3	24	4	5.3	
Charleston	48	14	92	29.99	30.04	+ .03	81.2	+ 0.9	96	31	87	70	11	75	18	75	73	83	5.04	− 1.9	13	6,262	sw.	31	se.	7	8	19	4	5.1	
Columbia, S. C.	351	41	57	29.66	30.03	+ .02	79.8	+ 0.3	95	28	89	65	27	70	26	72	69	78	4.67	− 2.1	11	3,764	sw.	27	ne.	17	7	17	7	5.2	
Augusta	180	89	97	29.83	30.02	+ .01	80.4	+ 1.5	98	31	89	66	27	72	25	73	70	79	3.92	− 1.6	13	3,300	s.	32	nw.	18	16	13	2	3.5	
Savannah	65	81	89	29.98	30.04	+ .03	80.9	+ 1.5	96	29	89	69	18	73	21	74	72	84	4.19	− 3.3	16	4,571	sw.	22	n.	9	8	18	5	5.2	
Jacksonville	43	101	129	30.01	30.06	+ .05	81.8	+ 1.7	95	30	90	70	5	74	20	75	74	86	6.53	+ 0.3	12	6,135	sw.	35	sw.	13	12	16	3	4.4	
Florida Peninsula.							**82.5**	**+ 0.8**										**78**	**2.62**	**− 3.3**										**4.0**	
Jupiter	28	10	48	30.03	30.06	+ .06	82.4	+ 0.9	92	28	89	68	9	76	22	76	74	81	3.10	− 2.8	9	6,423	sw.	30	nw.	10	7	24	0	4.5	
Key West	22	10	53	30.02	30.04	+ .06	83.6	− 0.2	92	13	89	71	14	78	17	76	73	72	2.16	− 2.5	12	5,387	e.	28	se.	16	10	17	4	4.5	
Sand Key	25	41	71	30.00	30.03	+ .05	82.4	......	93	31	86	71	16	78	18	...	...	...	1.45	− 3.2	12	7,972	e.	50	se.	16	11	20	0	4.3	
Tampa	35	79	96	30.03	30.06	+ .06	81.6	+ 1.6	93	22	89	70	10	74	21	75	73	81	3.75	− 4.8	13	4,718	ne.	32	ne.	13	24	5	2	2.5	
East Gulf States.							**80.8**	**+ 1.5**										**80**	**3.66**	**− 1.2**										**5.1**	
Atlanta	1,174	190	216	28.83	30.04	+ .03	78.2	+ 2.1	95	31	87	62	4	69	25	70	68	76	2.12	− 2.4	9	6,254	nw.	42	nw.	24	11	11	9	5.4	
Macon	370	55	66	29.64	30.03	+ .02	81.4	+ 3.2	99	31	92	64	26	71	33	...	...	...	1.51	− 2.7	6	2,753	sw.	25	w.	2	12	15	4	4.3	
Thomasville	273	8	57	29.76	30.05	+ .05	80.8	− 0.2	97	29	91	64	27	70	31	74	72	86	4.62	− 0.4	17	3,024	s.	29	e.	8	11	13	7	4.3	
Pensacola	56	79	96	29.98	30.04	+ .06	80.6	− 0.4	91	29	86	68	11	75	16	...	...	...	3.90	− 3.3	11	6,090	sw.	30	sw.	11	13	8	10	4.7	
Anniston	741	9	58	29.28	30.06	+ .07	79.1	+ 2.7	98	31	91	53	26	67	35	...	...	...	1.78	− 2.7	8	2,538	se.	22	sw.	23	7	19	5	5.5	
Birmingham	700	136	144	29.29	30.04	+ .05	81.0	+ 2.7	97	31	91	65	26	71	27	72	69	74	2.58	− 1.9	11	3,841	sw.	58	ne.	13	3	21	7	6.0	
Mobile	57	98	106	29.98	30.04	+ .06	81.3	+ 1.6	96	28	89	69	31	74	22	75	74	86	9.33	+ 2.5	20	4,385	sw.	32	nw.	19	4	22	5	5.7	
Montgomery	223	100	112	29.80	30.04	+ .05	81.2	+ 1.5	98	31	91	68	20	72	25	73	70	77	1.07	− 3.2	4	3,726	sw.	37	n.	8	7	22	2	4.9	
Meridian	375	84	93	29.64	30.02	+ .04	80.6	+ 2.1	97	31	91	65	21	70	26	72	70	80	5.32	+ 1.8	15	2,685	sw.	29	s.	20	12	15	4	4.4	
Vicksburg	247	62	74	29.76	30.04	+ .06	81.6	+ 2.0	96	12	91	67	11	72	28	74	72	82	2.72	− 0.8	6	3,506	sw.	38	ne.	11	8	19	4	5.1	
New Orleans	51	88	121	29.99	30.04	+ .06	82.8	+ 1.8	94	28	90	70	29	75	25	75	73	82	5.28	− 0.3	16	4,915	w.	48	se.	13	5	16	10	6.0	
West Gulf States.							**83.3**	**+ 2.5**										**73**	**1.13**	**− 1.9**										**3.7**	
Shreveport	249	77	84	29.75	30.01	+ .04	83.6	+ 2.2	102	12	94	68	21	74	26	74	70	72	2.43	+ 0.2	6	3,984	se.	43	ne.	31	22	7	2	3.0	
Bentonville	1,303	11	44	28.66	30.02	+ .05	79.6	+ 3.1	101	11	91	60	3	68	33	...	...	...	3.76	− 0.3	8	3,711	s.	32	n.	17	19	7	5	3.9	
Fort Smith	457	79	94	29.51	29.97	.00	83.0	+ 3.6	103	11	94	66	4	72	29	73	69	71	0.52	− 3.1	4	4,548	e.	34	e.	24	21	7	3	2.8	
Little Rock	357	93	100	29.63	30.00	+ .02	82.4	+ 3.2	103	11	92	65	24	72	26	73	69	72	1.58	− 2.1	9	4,602	s.	35	n.	24	4	19	8	5.7	
Corpus Christi	20	48	53	29.98	30.00	+ .07	82.5	+ 0.4	91	1	88	73	31	78	15	77	75	82	0.66	− 1.6	3	8,992	se.	29	se.	4	20	8	3	3.3	
Fort Worth	670	106	114	29.28	29.97	+ .03	85.6	+ 2.7	102	8	96	70	2	75	28	...	...	...	0.29	− 1.6	3	7,703	s.	30	s.	31	21	10	0	2.6	
Galveston	54	106	112	29.97	30.03	+ .07	83.3	+ 0.7	90	1	87	72	14	79	17	76	74	79	0.94	− 4.1	7	7,554	se.	36	ne.	13	17	9	5	4.1	
Palestine	510	73	79	29.46	29.98	+ .01	83.7	+ 3.2	99	12	94	68	31	73	25	73	69	69	0.29	− 1.9	2	5,050	s.	20	s.	14	5	22	4	5.7	
San Antonio	701	80	91	29.25	29.96	+ .03	85.0	+ 3.0	100	1	96	68	31	74	27	73	68	67	0.80	− 1.9	4	5,183	se.	24	nw.	14	19	11	1	3.4	
Taylor	583	55	63	29.38	29.99	+ .04	84.6	+ 2.9	98	1	96	68	31	74	26	...	...	...	0.06	− 2.4	3	6,506	s.	36	s.	31	23	7	1	2.5	
Ohio Val. and Tenn.							**74.3**	**− 0.6**										**75**	**3.01**	**− 0.4**										**5.2**	
Chattanooga	762	106	112	29.26	30.05	+ .05	78.5	+ 2.0	95	13	89	58	26	68	29	70	66	74	3.74	0.0	14	3,664	sw.	32	nw.	20	10	17	4	4.9	
Knoxville	1,004	93	100	29.01	30.04	+ .03	75.7	+ 1.0	90	31	86	52	4	66	27	68	66	78	2.16	− 1.8	14	2,864	ne.	24	nw.	17	1	18	12	6.6	
Memphis	399	76	97	29.61	30.03	+ .05	81.6	+ 2.4	98	10	90	65	24	74	22	73	70	74	0.49	− 2.7	5	5,158	sw.	36	nw.	21	17	7	7	4.3	
Nashville	546	79	91	29.47	30.04	+ .04	78.8	+ 1.0	96	30	90	56	4	68	31	70	66	73	2.53	− 0.9	13	3,135	nw.	24	w.	28	13	13	5	4.3	
Lexington	989	75	102	28.99	30.04	+ .03	72.8	− 1.8	90	12	82	56	4	64	24	...	...	...	2.07	− 1.5	11	5,411	w.	37	s.	16	11	13	7	4.8	
Louisville	525	111	132	29.47	30.04	+ .04	76.3	− 0.2	94	30	86	57	4	67	26	68	65	73	3.68	+ 0.2	8	4,570	nw.	26	sw.	16	9	13	9	5.3	
Evansville	431	72	82	29.54	30.00	+ .01	76.0	− 1.0	94	30	85	58	4	67	25	...	...	...	5.95	+ 2.7	10	3,988	s.	30	n.	7	12	15	4	4.5	
Indianapolis	822	154	164	29.16	30.03	+ .03	72.4	− 1.2	90	11	81	54	22	64	24	65	62	74	2.33	− 1.0	8	5,485	ne.	35	s.	7	10	14	7	5.2	
Cincinnati	628	152	160	29.37	30.04	+ .03	74.2	− 1.3	91	12	83	57	4	65	24	66	62	70	2.93	− 0.4	8	3,892	n.	22	w.	17	12	12	7	5.1	
Columbus	824	173	224	29.18	30.04	+ .03	71.0	− 2.0	91	12	80	51	22	61	26	64	61	76	2.74	− 0.5	8	6,708	sw.	40	w.	24	10	12	9	5.2	
Pittsburg	842	336	352	29.14	30.03	+ .02	69.8	− 2.7	87	12	78	51	29	62	26	62	58	70	1.89	− 1.3	9	5,550	nw.	28	w.	7	12	10	9	5.1	
Parkersburg	638	77	84	29.40	30.05	+ .04	71.2	− 2.1	89	8	80	54	3	62	24	65	63	80	3.40	− 0.1	11	3,063	sw.	43	nw.	17	15	8	8	4.6	
Elkins	1,940	41	50	28.05	30.06	+ .04	67.1	− 1.3	86	12	78	48	5	57	35	61	60	88	5.27	+ 1.6	18	1,846	w.	20	w.	2	11	12	8	5.4	
Lower Lake Region.							**67.0**	**− 2.5**										**70**	**1.25**	**− 1.8**										**4.4**	
Buffalo	767	178	206	29.19	30.01	+ .02	66.3	− 2.5	85	10	74	49	19	59	32	60	55	69	1.01	− 2.0	10	9,023	sw.	48	sw.	2	11	16	4	4.5	
Canton	448	10	71	29.51	29.98	......	63.8	− 4.0	90	12	75	40	19	52	42	...	...	...	1.22	− 1.5	10	7,558	sw.	44	sw.	2	11	12	8	5.4	
Oswego	335	76	91	29.63	30.00	+ .01	65.7	− 3.1	90	12	73	48	19	58	30	60	56	73	0.99	− 1.7	10	6,499	s.	27	nw.	2	11	13	7	4.6	
Rochester	523	81	102	29.46	30.02	+ .03	66.8	− 1.5	90	12	76	47	19	57	38	58	53	66	1.25	− 1.7	9	5,363	sw.	30	w.	24	12	12	7	4.6	
Syracuse	597	97	113	29.38	30.02	+ .03	66.0	− 2.6	90	12	75	48	19	57	35	...	...	...	1.26	− 2.1	10	7,524	s.	35	nw.	13	8	12	11	5.7	
Erie	713	92	102	29.26	30.02	+ .01	67.0	− 2.9	85	12	74	53	29	60	27	60	56	68	1.66	− 1.6	7	6,943	s.	28	s.	23	15	11	5	3.8	
Cleveland	762	190	201	29.22	30.03	+ .02	67.6	− 2.8	87	12	75	52	22	60	31	62	58	71	1.10	− 2.0	8	9,213	se.	36	nw.	1	17	12	2	3.8	
Sandusky	629	62	70	29.35	30.03	+ .02	69.4	− 2.1	88	19	77	51	3	62	30	...	...	...	1.59	− 1.8	8	5,074	ne.	27	nw.	1	17	9	5	3.5	
Toledo	628	207	246	29.36	30.03	+ .03	69.3	− 1.6	88	11	78	52	3	60	28	62	59	72	1.84	− 0.9	6	8,579	sw.	42	w.	1	17	10	4	3.5	
Detroit	730	218	258	29.25	30.03	+ .02	68.0	− 1.9	86	12	77	49	3	59	24	62	58	74	0.62	− 2.2	9	8,350	w.	34	w.	24	14	8	9	4.5	
Upper Lake Region.							**64.4**	**− 1.6**										**75**	**2.99**	**0.0**										**4.8**	
Alpena	609	13	92	29.34	30.01	+ .01	62.1	− 1.7	85	16	73	40	21	52	30	56	53	76	1.29	− 2.0	12	7,757	nw.	36	s.	16	13	13	5	4.2	
Escanaba	612	40	82	29.33	29.99	.00	61.6	− 2.8	84	16	70	41	21	53	27	57	53	75	3.48	− 0.1	10	7,002	s.	34	s.	19	13	14	4	3.9	
Grand Haven	632	54	92	29.33	30.00	+ .01	65.9	− 1.9	86	11	74	45	21	57	26	60	57	75	3.23	+ 0.6	7	6,795	w.	32	nw.	1	11	15	5	4.7	

TABLE I.—*Climatological data for U. S. Weather Bureau stations, August, 1907*—Continued.

Stations.	Elevation of instruments. Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Pressure, in inches. Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hrs.	Departure from normal.	Temperature of the air, in degrees Fahrenheit. Mean max. + mean min. ÷ 2	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches. Total.	Departure from normal.	Days with .01, or more.	Wind. Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Direction.	Date.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness during daylight, tenths.	Total snowfall.
Up. Lake Reg—Cont.																															
Grand Rapids	707	121	162	29.27	30.03	+ .03	68.2	− 1.8	91	11	79	46	21	58	29	60	56	70	2.40	− 0.2	7	6,582	sw.	37	w.	1	10	11	10	5.2	
Houghton	668	66	74	29.22	29.94	− .03	62.6	− 0.7	89	15	72	45	4	53	32	...	...	...	2.65	− 0.2	11	5,660	w.	30	w.	24	7	19	5	4.9	
Marquette	734	77	116	29.18	29.98	.00	62.5	− 1.0	89	6	71	46	20	54	29	56	52	72	2.21	− 0.6	10	8,194	w.	58	sw.	18	8	14	9	5.7	
Port Huron	638	70	120	29.33	30.02	+ .02	65.9	− 1.4	88	7	76	45	22	56	32	60	56	75	1.57	− 1.1	7	6,961	ne.	38	w.	1	12	13	6	4.2	
Sault Ste. Marie	614	40	61	29.30	29.99	.00	58.8	− 1.8	86	10	69	37	21	49	35	54	51	78	3.46	+ 0.3	13	6,450	nw.	44	nw.	17	10	11	10	5.7	
Chicago	823	140	310	29.15	30.02	+ .02	71.2	0.0	92	11	77	54	2	65	21	64	60	73	4.22	+ 1.3	9	9,186	ne.	44	sw.	6	11	15	5	4.6	
Milwaukee	681	122	138	29.30	30.04	+ .04	67.0	− 1.7	89	11	74	50	2	60	23	61	57	75	2.88	+ 0.1	8	6,493	w.	32	se.	26	16	12	3	3.9	
Green Bay	617	49	86	29.32	29.98	− .01	66.6	− 0.4	89	10	76	46	2	57	27	59	56	72	4.17	+ 1.1	12	6,782	s.	42	w.	16	7	13	11	6.2	
Duluth	1,133	11	47	28.73	29.94	− .03	60.5	− 4.4	84	6	69	40	20	52	29	55	52	79	4.28	+ 0.8	10	9,539	ne.	42	sw.	16	13	9	9	4.7	
North Dakota.							**64.9**	**− 1.9**										**67**	**2.14**	**− 0.2**										**4.6**	
Moorhead	940	8	57	28.91	29.92	− .04	65.5	− 0.4	94	10	77	37	20	54	37	60	57	79	4.10	+ 1.0	8	5,977	nw.	30	nw.	16	10	12	9	4.9	
Bismarck	1,674	8	57	28.15	29.91	− .03	67.2	− 0.9	98	14	82	34	20	52	43	57	50	61	0.61	− 1.4	4	8,549	nw.	48	w.	10	21	7	3	3.5	
Devils Lake	1,482	11	44	28.32	29.86	− .08	63.0	− 2.1	90	14	76	39	2	50	40	56	51	70	1.78	− 1.3	10	9,638	w.	52	w.	8	13	9	9	4.5	
Williston	1,875	14	44	27.92	29.87	− .06	63.8	− 4.1	98	8	78	34	21	49	47	54	46	58	2.06	+ 0.8	5	5,905	nw.	50	n.	10	7	14	10	5.6	
Upper Miss. Valley.							**71.9**	**− 1.1**										**77**	**5.31**	**+ 2.2**										**4.6**	
Minneapolis	...	102	208	...	...	...	69.0	...	94	31	79	48	20	59	26	...	...	...	5.58	+ 1.9	8	8,992	s.	62	w.	18	12	9	10	4.7	
St. Paul	837	171	179	29.06	29.95	− .02	68.3	− 1.2	92	31	78	48	20	59	26	61	56	69	4.07	+ 0.6	8	7,495	se.	47	nw.	1	9	17	5	5.3	
La Crosse	714	71	87	29.22	29.97	− .01	68.7	− 1.3	88	10	78	50	4	59	28	...	...	...	5.73	+ 2.3	10	4,909	s.	50	nw.	11	11	9	11	5.4	
Madison	974	70	78	28.97	29.99	.00	67.4	− 2.2	86	31	76	48	2	58	24	62	59	77	3.59	+ 0.4	12	5,862	s.	33	nw.	1	14	12	5	4.2	
Charles City	1,015	8	58	28.93	29.99	+ .02	67.8	− 2.9	91	31	78	45	3	57	32	63	61	83	6.72	+ 3.3	10	4,777	nw.	28	se.	8	12	13	6	4.7	
Davenport	606	71	79	29.35	30.00	+ .02	72.0	− 1.0	93	31	81	53	2	63	26	66	63	76	6.48	+ 2.8	10	4,734	e.	26	nw.	26	11	11	9	4.7	
Des Moines	861	84	101	29.10	29.99	+ .02	72.0	− 1.0	93	31	82	51	2	62	26	66	62	74	5.03	+ 1.4	9	5,345	s.	33	n.	29	7	18	6	5.1	
Dubuque	698	100	117	29.27	30.01	+ .03	70.1	− 1.9	92	31	80	51	2	61	25	64	60	76	5.85	+ 2.8	12	4,446	nw.	42	n.	6	14	9	8	4.3	
Keokuk	614	64	77	29.34	30.01	+ .03	74.2	− 0.4	95	31	84	53	22	65	27	67	65	79	5.50	+ 2.3	9	3,998	se.	30	n.	6	18	11	2	3.2	
Cairo	356	87	93	29.64	30.02	+ .03	77.8	− 0.8	96	30	86	63	26	70	22	72	70	81	2.43	− 0.5	11	4,501	ne.	48	ne.	7	15	9	7	4.5	
La Salle	536	56	64	29.46	30.02	+ .03	71.2	− 0.8	93	11	82	49	22	61	27	...	...	...	4.29	+ 1.4	13	4,477	ne.	33	w.	16	12	12	7	4.9	
Peoria	609	11	45	29.36	30.02	+ .03	71.9	− 0.6	94	11	82	48	4	61	30	66	63	78	6.60	+ 3.7	14	4,527	se.	58	n.	6	16	11	4	3.5	
Springfield, Ill	644	10	92	29.34	30.01	+ .02	74.0	0.0	96	11	84	54	4	64	26	67	64	76	7.13	+ 4.3	12	5,416	w.	34	nw.	17	13	12	6	4.3	
Hannibal	534	75	109	29.44	30.00	+ .02	74.1	− 0.9	95	31	84	52	4	65	27	...	...	...	6.27	+ 2.9	14	5,798	sw.	39	n.	7	12	11	8	4.7	
St. Louis	567	208	217	29.41	30.00	+ .01	76.6	− 0.6	98	11	84	60	21	69	23	70	67	75	4.36	+ 1.7	11	6,298	s.	36	ne.	7	12	11	8	4.8	
Missouri Valley.							**74.4**	**+ 0.6**										**66**	**2.61**	**− 0.8**										**4.0**	
Columbia, Mo	784	11	84	29.17	29.98	+ .01	75.3	+ 0.6	96	10	86	53	25	65	30	...	...	...	3.48	+ 0.4	13	4,555	se.	35	nw.	19	17	8	6	3.5	
Kansas City	963	116	181	29.00	30.00	+ .03	76.6	+ 0.8	97	10	85	58	22	68	30	69	65	73	3.80	− 1.0	11	8,431	s.	43	n.	19	13	14	4	4.2	
Springfield, Mo	1,324	98	104	28.63	30.00	+ .03	78.5	+ 3.7	100	11	87	60	4	70	24	69	65	69	4.05	− 0.3	8	6,118	s.	20	se.	4	19	8	4	3.1	
Iola	984	40	47	28.96	29.98	+ .02	78.8	+ 2.5	101	9	89	60	3	68	31	...	...	...	3.66	+ 0.2	13	5,219	sw.	31	sw.	16	17	8	6	4.3	
Topeka	...	85	89	...	...	...	77.2	+ 1.2	98	10	87	56	22	68	29	...	...	...	3.14	− 1.2	12	5,652	s.	39	sw.	15	16	11	4	3.8	
Lincoln	1,189	11	84	28.70	29.94	− .01	75.4	+ 1.1	97	10	87	52	22	64	28	66	62	70	4.17	+ 0.5	7	6,621	se.	38	sw.	7	14	13	4	4.0	
Omaha	1,105	115	121	28.81	29.96	.00	74.8	+ 0.4	94	18	84	55	2	66	25	66	62	70	3.03	− 0.6	6	5,512	s.	36	nw.	11	11	15	5	4.9	
Valentine	2,598	47	54	27.27	29.93	− .01	70.4	− 0.9	102	9	85	38	20	56	42	60	53	59	1.19	− 1.6	6	8,009	s.	44	s.	30	17	14	0	3.5	
Sioux City	1,135	96	164	28.77	29.96	+ .01	71.4	− 1.2	94	10	82	45	3	61	33	...	...	...	1.53	− 1.5	11	8,987	se.	55	se.	7	13	13	5	4.2	
Pierre	1,572	70	75	28.27	29.90	− .04	73.6	+ 0.5	107	9	87	46	2	60	42	60	52	55	1.76	− 0.2	7	7,665	se.	39	se.	30	16	13	2	3.5	
Huron	1,306	56	67	28.56	29.94	− .01	69.4	+ 0.3	96	10	83	39	20	55	39	60	55	67	0.16	− 2.5	3	8,691	se.	36	se.	22	14	11	6	4.0	
Yankton	1,233	49	57	28.64	29.93	− .02	71.6	− 1.2	98	18	84	45	20	59	37	...	...	...	1.38	− 1.7	7	5,291	s.	35	nw.	11	12	12	7	4.8	
Northern Slope.							**63.6**	**− 2.8**										**59**	**1.26**	**+ 0.1**										**4.0**	
Havre	2,505	11	44	27.30	29.89	− .02	62.9	− 4.0	92	17	77	33	19	49	49	53	46	60	1.02	− 0.2	8	6,674	w.	37	w.	15	23	5	3	3.4	
Miles City	2,371	26	48	27.42	29.92	− .01	69.4	− 2.1	104	9	85	39	20	54	54	57	50	59	1.02	0.0	9	4,559	ne.	39	w.	14	22	8	1	2.5	
Helena	4,110	8	56	25.80	29.94	.00	61.6	− 4.5	87	17	75	37	29	48	41	49	40	53	1.00	+ 0.3	8	5,131	sw.	35	sw.	29	15	12	4	3.9	
Kalispell	2,962	8	34	26.91	29.93	.00	59.0	− 3.9	90	1	72	36	31	46	38	50	45	67	2.54	+ 1.6	11	3,650	w.	25	w.	14	9	11	11	5.5	
Rapid City	3,234	46	50	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Cheyenne	6,088	56	64	24.10	29.93	+ .01	65.3	− 0.5	88	9	79	40	11	51	38	52	45	56	0.80	− 0.7	8	6,725	s.	40	s.	29	6	16	9	5.4	
Lander	5,372	26	36	24.68	29.93	+ .01	63.2	− 2.5	90	8	82	35	11	45	50	50	40	53	0.69	+ 0.2	9	3,037	sw.	28	w.	25	9	22	0	4.0	
Sheridan	3,790	5	...	26.09	29.93	...	64.6	...	99	9	83	37	11	46	54	...	...	...	0.09	...	3	...	sw.	...	...	...	12	13	6	4.0	
Yellowstone Park	6,200	11	48	23.93	29.94	+ .01	55.8	− 5.1	80	13	70	30	19	42	41	44	36	55	0.90	− 0.1	9	5,314	sw.	38	w.	2	14	13	4	4.1	
North Platte	2,821	11	51	27.09	29.96	+ .02	72.0	− 0.2	100	10	86	48	21	58	41	63	59	71	2.14	− 0.3	10	4,959	se.	33	n.	10	20	3	8	3.2	
Middle Slope.							**76.9**	**+ 1.6**										**62**	**2.24**	**− 0.2**										**4.6**	
Denver	5,291	129	136	24.80	29.95	+ .03	71.2	+ 0.8	94	9	85	53	19	58	36	56	47	51	0.23	− 1.1	7	4,987	s.	30	ne.	1	9	16	6	5.1	
Pueblo	4,685	80	86	25.34	29.93	+ .02	73.2	+ 1.1	95	10	87	54	28	60	36	57	49	53	1.20	− 0.4	6	4,547	nw.	36	nw.	18	11	14	6	4.8	
Concordia	1,398	42	47	28.51	29.94	− .01	78.2	+ 1.7	101	10	89	54	22	67	34	67	63	66	1.34	− 1.5	8	5,292	s.	26	sw.	7	5	23	3	4.9	
Dodge	2,509	44	54	27.37	29.93	.00	77.0	+ 0.5	100	15	88	56	20	66	31	66	63	69	4.08	+ 1.5	11	6,806	se.	41	w.	16	13	13	5	4.7	
Wichita	1,358	78	86	28.57	29.97	+ .02	79.4	+ 1.9	102	9	91	58	20	68	35	69	65	68	5.80	+ 2.7	9	5,766	se.	30	n.	20	16	11	4	4.1	
Oklahoma	1,214	10	47	28.70	29.94	00	82.2	+ 3.7	102	11	94	65	21	71	30	70	66	67	0.80	− 2.4	5	10,321	s.	54	s.	22	17	8	6	3.9	
Southern Slope.							**81.5**	**+ 2.4**										**61**	**2.15**	**− 0.1**										**3.7**	
Abilene	1,738	45	54	28.17	29.92	.00	85.4	+ 4.2	100	5	96	70	1	74	27	69	61	50	0.35	− 1.6	3	6,149	s.	27	s.	4	16	13	2	3.8	
Amarillo	3,676	10	49	26.28	29.92	.00	76.4	+ 1.8	97	15	88	58	31	64	35	65	60	67	6.20	+ 3.4	10	9,019	s.	50	s.	30	16	11	4	4.4	
Del Rio	944	8	57	28.96	29.92	+ .02	86.1	+ 2.1	101	2	97	73	2	75	28	...	...	...	0.00	− 2.7	0	8,092	se.	31	ne.	13	26	5	0	2.3	
Roswell	3,578	9	57	26.34	29.88	.00	78.0	+ 1.4	100	10	92	60	31	64	37	65	60	65	2.06	+ 0.6	12	3,347	s.	25	w.	7	15	13	3	4.2	
Southern Plateau.							**76.4**	**− 0.9**										**50**	**1.97**	**+ 0.5**										**3.6**	
El Paso	3,762	10	110	26.18	29.84	.00	80.2	+ 1.6	100	11	91	63	30	69	30	64	56	52	2.50	+ 0.8	11	5,888	nw.	48	sw.	5	9	18	4	4.5	
Santa Fe	7,013	33	39	23.37	29.89	.00	66.6	− 0.4	87	16	78	50	30	56	31	55	48	60	3.16	+ 0.6	16	5,395	se.	29	se.	11	15	11	5	4.4	
Flagstaff	6,907	8	57	23.46	29.88	+ .04	61.6	− 1.2	82	8	74	36	30	49	36	52	47	69	5.36	+ 2.1	13	4,139	sw.	26	sw.	9	7	14	10	5.9	
Phoenix	1,108	50	56	28.68	29.80	+ .01	87.7	− 1.3	109	8	100	64	30	76	31	69	59	44	0.80	− 0.2	6	3,375	e.	34	se.	18	13	15	3	4.3	
Yuma	141	16	46	29.62	29.76	.00	88.2	− 1.9	110	8	102	58	30	74	37	70	61	47	T.	− 0.4	0	4,726	se.	31	s.	18	28	3	0	0.8	
Independence	3,910	11	42	25.93	29.83	+ .02	74.2	− 2.2	96	16	89	48	30	60	35	54	34	27	0.00	0.0	0	5,441	se.	32	se.	23	28	2	1	1.7	
Middle Plateau.							**68.3**	**− 1.7**										**44**	**1.16**	**+ 0.5**										**3.9**	
Reno	4,532	56	63	25.46	29.88	+ .04	65.6	− 1.4	93	16	82	38	10	49	45	50	37	44	0.30	0.0	2	4,156	w.	26	nw.	26	23	6	2	2.7	
Tonopah	6,089	12	20	24.10	29.89	...	69.6	+ 3.9	90	16	82	41	10	58	32	49	29	25	T.	− 0.4	0	6,368	se.	33	se.	31	17	13	1	3.0	
Winnemucca	4,344	18	56	25.60	29.93	+ .05	65.1	− 5.7	96	1	83	36	30	47	48	48	35	41	0.14	0.0	2	3,802	sw.	26	sw.	1	25	3	3	2.1	
Modena	5,479	10	43	24.63	29.87	+ .01	67.2	− 1.4	88	8	83	41	31	52	39	51	38	44	0.77	+ 0.4	4	8,655	sw.	44	sw.	9	10	14	7	4.5	
Salt Lake City	4,366	105	110	25.61	29.90	− .01	71.0	− 4.5	93	7	83	46	11	59	32	55	43	42	1.69	+ 0.9	7	4,865	se.	64	w.	3	13	15	3	3.9	
Durango	6,546	18	56	23.76	29.93	+ .03	65.4	− 0.9	89	17	79	46	22	52	40	53	48	64	3.62	+ 1.8	20	3,364	nw.	22	w.	24	2	19	10	6.5	
Grand Junction	4,608	43	51	25.40	29.92	+ .02	73.9	− 2.2	96	9	86	54	30	61	33	57	47	46	1.62	+ 0.5	13	4,318	e.	31	sw.	14	15	10	6	4.5	
Northern Plateau.							**65.8**	**− 4.6**										**45**	**1.19**	**+ 0.8**										**3.6**	
Baker City	3,471	48	58	26.44	29.98	+ .03	61.0	− 3.9	95	1	75	37	30	47	41	48	36	46	0.38	0.0	4	4,662	nw.	22	n.	8	20	9	2	2.6	
Boise	2,739	78	86	27.12	29.93	.00	68.2	− 3.6	100	1	82	44	28	54	40	51	36	37	0.14	0.0	4	3,529	nw.	30	w.	23	26	4	1	1.9	
Lewiston	757	10	51	29.15	29.94	− .01	68.6	− 4.9	106	1	82	44	31	55	39	...	...	...	1.82	+ 1.4	6	4,488	e.	48	s.	24	15	9	7	4.1	
Pocatello	4,477	46	54	25.49	29.92	.00	66.3	− 4.2	91	13	80	41	19	53	41	50	37	42	1.65	+ 1.1	9	6,075	se.	34	sw.	10	20	11	0	2.6	
Spokane	1,929	101	110	27.94	29.96	+ .01	63.0	− 4.9	97	1	75	40	19	51	40	52	43	54	2.07	+ 1.6	9	5,046	s.	27	sw.	14	8	14	9	5.7	
Walla Walla †	1,000	71	79	28.92	29.98	+ .02	67.8	− 6.0	102	1	80	41	31	56	36	54	43	45	1.09	+ 0.6	7	4,545	s.	24	sw.	17	14	8	9	4.5	
N. Pac. Coast Reg.							**59.6**	**− 1.4**										**76**	**0.99**	**+ 0.2**										**5.6**	
North Head	211	11	56	29.86	30.08	+ .05	57.0	− 0.9	75	31	60	50	20	54	24	54	52	87	1.16	+ 0.6	15	11,459	nw.	54	se.	6	10	11	10	5.5	
Port Crescent	259	12	29	29.81	30.09	+ .07	54.3	− 1.9	70	20	62	36	30	47	31	...	...	...	0.30	− 0.4	5	3,704	nw.	14	w.	3	11	9	11	5.3	
Seattle	123	185	224	29.95	30.08	+ .08	61.3	− 1.8	79	1	69	47	30	54	24	55	51	72	0.80	+ 0.3	8	5,188	s.	29	sw.	13	5	16	10	6.2	
Tacoma	213	113	120	29.82	30.04	+ .02	61.0	− 2.0	80	16	70	44	30	52	28	...	...	...	1.53	+ 0.8	7	4,358	n.	21	w.	16	8	13	10	5.9	
Tatoosh Island	86	7	57	29.97	30.07	+ .07	54.9	− 0.4	65	31	59	45	30	50	19	53	52	89	1.02	− 1.1	8	8,084	sw.	48	sw.	6	6	6	19	7.2	
Portland, Oreg	153	68	106	29.89	30.05	+ .04	64.6	− 1.3	86	20	74	49	30	55	28	57	51	65	1.02	+ 0.4	6	4,850	nw.	27	ne.	31	10	13	8	4.9	
Roseburg	510	9	57	29.49	30.04	+ .04	64.4	− 1.8	90	16	79	39	31	50	43	55	49	66	1.09	+ 0.8	5	2,630	n.	19	nw.	14	15	10	6	3.9	

TABLE I.—*Climatological data for U. S. Weather Bureau stations, August, 1907*—Continued.

Stations.	Elevation of instruments: Barometer above sea level, feet.	Elevation of instruments: Thermometers above ground.	Elevation of instruments: Anemometer above ground.	Pressure, in inches: Actual, reduced to mean of 24 hours.	Pressure, in inches: Sea level, reduced to mean of 24 hrs.	Pressure, in inches: Departure from normal.	Temperature: Mean max. + mean min. ÷ 2.	Temperature: Departure from normal.	Temperature: Maximum.	Temperature: Date.	Temperature: Mean maximum.	Temperature: Minimum.	Temperature: Date.	Temperature: Mean minimum.	Temperature: Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation: Total.	Precipitation: Departure from normal.	Precipitation: Days with .01, or more.	Wind: Total movement, miles.	Wind: Prevailing direction.	Maximum velocity: Miles per hour.	Maximum velocity: Direction.	Maximum velocity: Date.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness during daylight, tenths.	Total snowfall.
Mid. Pac. Coast Reg.							65.8	− 0.9										64	0.45	+ 0.4										4.0	
Eureka	62	62	80	29.95	30.02	+ .02	55.8	0.0	65	7	60	47	31	52	13	53	51	85	2.66	+ 2.6	2	4,791	nw.	36	n.	26	9	16	6	5.1	
Mount Tamalpais	2,375	11	18	27.51	29.94	+ .01	66.2	....	88	15	74	45	27	59	29	53	42	50	0.04	0.0	2	10,006	nw.	60	nw.	9	23	5	3	2.1	
Point Reyes Light	490	7	18	29.41	29.92	......	55.4	....	64	8	59	48	15	52	13	....	....	....	0.05	....	1	13,544	nw.	60	nw.	9	6	6	19	7.5	
Red Bluff	332	50	56	29.50	29.84	− .02	77.1	− 3.9	100	15	91	55	31	63	35	61	48	43	0.00	0.0	0	3,622	se.	20	s.	31	23	6	2	2.0	
Sacramento	69	106	117	29.80	29.87	+ .02	70.8	− 1.3	99	15	85	52	29	57	39	60	53	60	0.00	0.0	0	6,447	s.	22	s.	7	25	6	0	1.3	
San Francisco	155	200	204	29.77	29.94	+ .02	59.8	+ 1.3	74	10	65	51	17	54	19	55	52	83	0.02	0.0	1	7,846	w.	32	w.	20	11	16	4	4.4	
San Jose	141	78	88	29.79	29.94	....	66.0	− 0.7	88	12	79	46	28	53	39	....	....	....	0.00	0.0	0	....	nw.	....	......	...	27	3	1	2.5	
Southeast Farallon	30	9	17	29.93	29.96	....	55.8	....	64	8	58	48	26	53	9	....	....	....	0.06	....	1	10,402	nw.	46	n.	9	6	8	11	7.2	
S. Pac. Coast Reg.							69.4	− 1.1										66	T.	0.0										2.6	
Fresno	330	67	70	29.51	29.85	+ .03	77.9	− 3.3	103	16	95	52	28	61	41	59	43	38	T.	0.0	0	4,296	nw.	16	nw.	9	27	3	1	1.5	
Los Angeles	338	116	123	29.56	29.92	+ .04	69.2	+ 0.6	86	21	79	56	24	59	28	61	58	77	0.00	0.0	0	4,072	w.	19	s.	31	18	12	1	3.2	
San Diego	87	94	102	29.83	29.92	+ .03	67.2	− 1.5	75	20	71	60	11	63	13	62	59	76	0.00	0.0	0	4,246	w.	18	nw.	9	30	1	0	2.0	
San Luis Obispo	201	47	54	29.74	29.96	+ .02	63.4	− 0.1	87	11	74	46	29	53	33	56	52	74	0.00	0.0	0	3,508	nw.	20	sw.	10	13	6	2	3.9	
West Indies.																															
Grand Turk	11	6	20	30.04	30.05	+ .07	83.5	....	92	22	90	69	21	77	....	....	....	....	1.86	....	12	....	e.	36	ne.	30	....	....	....	....	
San Juan	82	48	90	29.94	30.08	+ .06	80.5	......	90	26	86	72	11	75	15	75	73	77	5.50	−0.4	23	8,901	e.	34	e.	11	19	10	2	3.4	
Panama.																															
Ancon	74	....	....	....	29.85	....	81.0	....	93	10	88	72	28	74	19	....	....	....	7.46	....	22	....	....	....	......	...	1	6	24	....	
Bas Obispo	40	....	....	....	29.85	....	78.6	....	88	23	85	71	30	73	17	....	....	....	12.20	....	26	3,372	nw.	32	e.	4	0	6	25	....	
Naos	......	....	....	....	29.84	....	80.8	....	92	6	87	70	4	74	20	....	....	....	6.55	....	16	6,111	nw.	42	e.	4	0	18	13	....	
Christobal	......	....	....	....	29.82	....	79.4	....	86	8	83	73	30	75	12	....	....	....	18.89	....	26	6,834	w.	28	nw.	1	2	17	12	....	

* More than one date. † Record incomplete.

TABLE II.—*Climatological record of cooperative observers, August, 1907.*

Stations.	Temperature (Fahrenheit): Maximum.	Temperature (Fahrenheit): Minimum.	Temperature (Fahrenheit): Mean.	Precipitation: Rain and melted snow.	Precipitation: Total depth of snow.
Alabama.	°	°	°	*Ins.*	*Ins.*
Ashville	99	56	79.5	5.40	
Auburn	96	67	79.0	2.31	
Bermuda	97	66	80.2	6.32	
Boligee	104	62	82.4	2.54	
Bridgeport	......	......	......	1.50	
Calera	......	......	......	2.55	
Camphill	102	58	77.7	3.50	
Cedar Bluff	......	......	......	6.62	
Citronelle	97[c]	67[c]	81.2[c]	......	
Clanton	98	64	80.0	3.82	
Dadeville	......	......	......	1.70	
Decatur	100	62	81.6	3.02	
Demopolis	......	......	......	1.80	
Eufaula	93	66	78.8	6.63	
Evergreen	100	63	81.8	4.33	
Flomaton	99	65	84.2	3.65	
Florence	99	57	80.6	1.99	
Fort Deposit	98	68	81.6	3.63	
Gadsden	100	56	80.4	4.16	
Good Water	98	60	80.2	4.07	
Greensboro	96	69	81.7	2.39	
Guntersville	......	......	......	2.38	
Hamilton	101[1]	58[b]	82.3[c]	1.90	
Highland Home	98	60	79.8	3.41	
Letohatchee	......	......	......	1.82	
Livingston	98	67	81.2	4.42	
Lock No. 4	98	58	80.1	2.90	
Lucy	96	62	80.2	7.33	
Madison Station	98	56	79.4	2.62	
Maplegrove	98	54	78.8	3.72	
Newbern	102	67	83.0	1.12	
Oneonta	96	55	78.6	5.27	
Opelika	95	62	79.4	1.65	
Ozark	96	65	80.6	8.20	
Prattville	99	67	80.4	4.49	
Pushmataha	104	63	82.0	2.48	
Riverton	99[c]	56	76.6[b]	3.58	
Scottsboro	95	55	77.4	4.80	
Selma	101	68	82.4	3.54	
Spring Hill	92	70	80.4	......	
Talladega	98[d]	62[d]	81.2[d]	2.45	
Tallassee	......	......	......	1.59	
Thomasville	98	67	81.0	6.12	
Tuscaloosa	102	64	82.5	2.72	
Tuscumbia	99	59	80.8	1.42	
Tuskegee	101	67	81.9	1.00	
Union Springs	97	68	81.0	3.65	
Uniontown	101	66	82.4	1.43	
Valley Head	100	55	77.9	3.74	
Vienna	......	......	......	1.40	
Wetumpka	101	65	81.2	1.78	
Alaska.					
Deering	82	24	51.0	......	
Fairbanks	84	36	55.4	1.81	
Holy Cross Mission	72	33	51.7	5.39	
Juneau	77	43	56.1	6.88	
Alaska—Cont'd.	°	°	°	*Ins.*	*Ins.*
Katalla	78	36	53.9	11.41	
Killisnoo	70	40	53.8	4.65	
Rampart	84	31	55.3	3.38	
St. Johns	76	27	52.8	2.49	
St. Michael	68	32	51.7	......	
Sitka	77	43	54.4	12.60	
Tonsina	76	28	53.6	0.53	
Arizona.					
Allaire Ranch	......	......	......	5.65	
Arizona Canal Co. Dam	109	64	88.0	2.35	
Aztec	118	70	98.0	0.00	
Benson	100	56	78.2	1.85	
Bisbee	86	55	70.5	4.97	
Bonita	......	......	......	3.59	
Bowie	102	59	79.6	5.28	
Buckeye	112	54	86.2	0.85	
Casa Grande	120	60	93.8	0.60	
Chiarsons Mill	67	42	54.8	6.92	
Clifton	......	......	......	3.18	
Cline	102	50	77.4	2.81	
Cochise *1	100	65	79.5	3.94	
Columbia	109	59	83.1	2.80	
Congress	101	60	83.2	0.76	
Douglas	100	56	79.8	3.72	
Dudleyville	100	62	80.4	5.89	
Fish Creek	......	......	......	2.37	
Flagstaff	82	34	62.7	4.55	
Fort Apache	94	49	72.0	5.20	
Fort Huachuca	93	46	68.5	8.50	
Fort Mohave	114	64	92.2	0.40	
Gila Bend	115	68	92.2	1.00	
Globe	103	56	78.6	4.17	
Grand Canyon	90	40	63.6	6.29	
Greaterville	89	54	71.2	7.86	
Holbrook	96	49	73.2	1.89	
Huachuca Reservoir	......	......	......	3.53	
Intake	......	......	......	3.71	
Jerome	96	50	75.7	3.30	
Keams Canyon	88	46	67.8	2.09	
Kingman	104	43	80.6	0.71	
Maricopa	116	69	90.5	0.87	
Mesa	113	59	87.5	1.47	
Mohawk Summit	113	75	95.4	0.00	
Natural Bridge	......	......	......	3.23	
Nutrioso	......	......	......	5.97	
Oracle	94	58	76.4	5.54	
Phoenix (Ex. Farm)	108	61	87.7	0.40	
Picacho *5	108	78	94.4	0.41	
Pinal Ranch	......	......	......	4.93	
Pinto	......	......	......	1.63	
Prescott	94	40	68.0	3.93	
Roosevelt	110	60	85.6	4.10	
St. Johns	91	44	69.2	5.10	
St. Michaels	90	40	65.0	3.70	
San Carlos	108	60	83.6	9.80	
San Simon	99	58	84.2	0.95	
Arizona—Cont'd.	°	°	°	*Ins.*	*Ins.*
Seligman	93	39	70.2	0.11	
Sentinel	113	75	92.0	0.00	
Silverbell	104	64	82.4	3.33	
Tempe	114	58	88.4	1.55	
Thatcher	103	62	80.3	2.55	
Tombstone	92	57	73.2	4.80	
Tucson	102	63	83.0	3.46	
Upper San Pedro	97	52	75.2	1.75	
Vail *5	102	72	89.2	1.08	
Walnut Grove	......	......	......	2.50	
Willcox	97	54	76.4	3.60	
Williams	85	40	66.0	1.69	
Yarnell	......	......	......	1.52	
Arkansas.					
Alicia	102[f]	59[f]	80.2[f]	4.80	
Amity	103	66	81.0	4.28	
Arkadelphia	108	66	84.8	2.00	
Arkansas City	......	......	......	0.46	
Batesville	109	60	83.6	1.47	
Bee Branch	108	63	82.6	3.60	
Benton	106	65	83.3	2.83	
Bergman	105	54	78.3	3.58	
Booneville	106	54	82.6	2.90	
Brinkley	106	63	83.0	1.12	
Camden	99	67	81.3	4.83	
Center Point	107	67	83.8	2.58	
Clarendon	......	......	......	1.79	
Conway	107	66	84.2	4.59	
Corning	101	55	79.8	5.07	
Dardanelle	......	......	......	2.14	
Dodd City	104	59	80.1	2.20	
Dutton	99	57	76.9	2.21	
Earl	104[d]	65[d]	83.4[d]	2.75	
El Dorado	104	68	83.2	4.70	
England	102	66	83.1	0.80	
Eureka Springs	105	60	80.3	4.37	
Fayetteville	102	63	81.6	3.83	
Forrest City	102	64	82.0	3.93	
Fulton	......	......	......	0.60	
Hardy	104	58	80.4	3.51	
Heber	113	61	84.5	0.72	
Helena	101	66	83.1	1.49	
Hope	108	68	84.7	0.94	
Hot Springs	104	63	80.3	2.71	
Jonesboro	106	57[a]	81.4[g]	2.92	
Junction	100	66	81.0	4.35	
La Crosse	108	64	83.4	1.43	
Lewisville	109	65	83.4	2.80	
Lutherville	105	60	81.3	2.65	
Luxora	......	......	......	2.08	
Malvern	103	65	80.6	0.85	
Mammoth Spring	103	54	79.6	1.63	
Marked Tree	......	......	......	4.00	
Marvell	107	64	83.2	5.10	
Mena	102	64	81.4	2.01	
Montrose	102	66	82.4	1.77	

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Arkansas—Cont'd.					
Mossville	100	58	78.8	0.93	
Mount Nebo	97	64	79.5	1.69	
Newport	111	62	83.7	7.56	
Ozark	106	63	83.5	2.35	
Pine Bluff	104	66	83.2	3.02	
Pocahontas	105	57	81.0	8.52	
Pond	102	56	80.0	4.45	
Prescott	106	67	83.6	2.00	
Princeton	107	65	82.6	2.13	
Rogers	102	62	79.6	4.85	
Russellville	107	64	83.0	2.34	
Spielerville	106	65	83.8	2.42	
Stuttgart	106	65	82.8	3.80	
Texarkana	109	70[e]	87.9[b]	3.04	
Warren	109	65	84.6	1.13	
Wiggs	103	61	79.8	6.73	
California.					
Alturas	94	31	62.3	0.27	
Auburn	94	50	74.2	0.00	
Azusa	95	48	70.4	0.00	
Bagdad	110	68	93.6	0.00	
Bakersfield	106	49	78.6	0.00	
Berkeley	77	52	62.4	0.00	
Bishop	95	38	69.9	T.	
Blocksburg	98	41	65.6	0.46	
Blue Canyon	84	36	62.6	0.00	
Branscomb	92	40	64.4	0.20	
Brush Creek	96	42	67.7	T.	
Calexico	108	56	87.2	0.00	
Campbell	90	43	64.6	0.00	
Cedarville	98	34	64.5	0.20	
Chico	107	51	78.4	0.00	
Claremont	99	50	71.5	0.00	
Cloverdale	100	45	69.4	T.	
Colusa	97	49	75.0	0.00	
Crescent City	73	36	56.2	2.04	
Crockers	.....	.....	.....	T.	
Cuyamaca	79	41	63.4	0.00	
Delta	100	45	73.0	0.23	
Dimond	.....	.....	.....	T.	
Dobbins	102	55	78.2	0.00	
Durham	103	51	74.9	T.	
El Cajon	94	52	72.3	0.00	
Electra	103	56	82.0	0.00	
Elmwood	103	49	74.6	0.00	
Elsinore	102	46	72.4	0.00	
Escondido	95	46	70.1	0.00	
Folsom	104	52	76.2	0.00	
Fordyce	.....	.....	.....	0.25	
Gold Run	95	41	71.2	0.00	
Greenville	92	31	61.4	T.	
Hanford	106	40	72.6	0.00	
Healdsburg	103[c]	42[c]	68.1[c]	0.00	
Heber	115	54	89.1	T.	
Hollister	91	42	63.8	0.00	
Idyllwild	85	33	65.6	0.00	
Indio	112	65	90.3	0.00	
Iowa Hill	92	48	69.6	0.00	
Isabella	.....	.....	.....	0.00	
Jamestown	99	50	71.8	0.00	
Jolon	.....	.....	.....	T.	
Kennedy Gold Mine	.....	.....	.....	T.	
Kentfield	.....	.....	.....	0.00	
King City	92	44	65.2	0.00	
LaPorte	81	36	59.2	0.01	
Le Grande	106	52	78.8	0.00	
Lemoncove	104	48	77.7	0.00	
Lick Observatory	84	42	66.4	0.00	
Livermore	101	48	69.6	0.00	
Lodi	96	50	69.4	0.00	
Lone Pine	94	42	69.4	T.	
Los Gatos	91	47	66.2	T.	
Magalia	95	42	68.2	0.00	
Mammoth	118	52	92.5	T.	
Marysville	100	65	84.8	0.00	
Merced	101	52	74.8	0.00	
Mills College	.....	.....	.....	0.00	
Milo	.....	.....	.....	0.00	
Milton (near)	98	53	74.4	0.00	
Mojave	102	67	86.4	0.00	
Mokelumne Hill	97	50	73.0	0.00	
Mono Ranch	88	37	64.4	0.00	
Montague	96	39	67.0	2.22	
Monterio	102	50	76.1	0.00	
Monumental	91	34	63.9	2.49	
Mount St. Helena	.....	.....	.....	0.00	
Napa	92	54	67.5	0.00	
Needles	113	70	94.0	0.00	
Nevada City	95	39	66.6	0.00	
Newcastle	102	50	74.3	0.00	
Newman	106	51	76.4	0.00	
Nimshew	96	42	71.2	0.00	
North Bloomfield	91	39	64.6	0.00	
Oakland	80	52	63.4	0.00	
Ojai Valley	97	45	67.8	T.	
Orland	107	52	77.8	0.02	
Orleans	108	46	76.8	1.72	
Oroville (near)	103	53	76.0	0.00	
California—Cont'd.					
Palermo	104	51	74.8	T.	
Pilot Creek	.....	.....	.....	0.00	
Pine Crest	87	48	65.8	0.04	
Placerville	92	44	66.3	0.00	
Point Lobos	72	54	61.4	T.	
Porterville	103	50	76.8	0.00	
Poway	96	54	74.2	0.00	
Quincy	90	34	60.6	T.	
Redding	99	57	77.4	0.05	
Redlands	100	51	72.9	0.00	
Reedley	104	47	76.8	T.	
Represa	.....	.....	.....	0.00	
Rialto	99	52	74.6	0.00	
Riverside	100	50	73.1	0.00	
Rocklin	100	52	73.6	0.00	
Sacramento	90	51	68.4	0.00	
Salinas	80	48	63.6	0.00	
San Bernardino	103	48	74.0	0.00	
San Jacinto	104	48	75.5	0.00	
Santa Barbara	83	53	65.5	0.03	
Santa Clara College	89	45	66.0	0.00	
Santa Cruz	85	45	61.8	T.	
Santa Maria	83	48	63.6	0.00	
Santa Monica	73	52	62.9	0.00	
Santa Rosa	95	41	65.1	0.00	
Sausalito	.....	.....	.....	0.00	
Shasta	108	52	79.6	0.02	
Sierra Madre	92	53	70.6	0.00	
Stirling City	89	45	66.2	0.00	
Stockton	94	53	70.8	0.00	
Storey	102	45	73.8	T	
Summerdale	85	43	64.1	0.07	
Summit	72	21	53.0	T.	
Susanville	89	34	63.0	0.10	
Tamarack	80	28	54.0	0.38	T.
Towle	91	42	65.6	0.00	
Truckee	72	30	52.0	0.00	
Tulare	100	46	73.2	T.	
Tustin (near)	.....	.....	.....	0.00	
Ukiah	104	42	70.1	0.00	
Upper Lake	98	44	71.4	T.	
Upper Mattole	.....	.....	.....	1.62	
Vacaville	104	49	72.4	0.00	
Visalia	101	10	68.9	0.00	
Wasco	106	41	77.0	0.00	
West Saticoy	.....	.....	.....	0.00	
Wheatland	99	53	73.8	0.00	
Willits	100	29	70.3	0.00	
Willows	98	52	74.5	0.01	
Woodleaf	.....	.....	.....	0.00	
Woodside	86	46	64.6	0.00	
Yosemite	98	39	66.6	0.47	
Colorado.					
Akron	.....	.....	.....	5.13	
Alamosa	88	41	60.9	.....	
Arriba	93	48	69.0	1.79	
Ashcroft	81	34	54.0	2.32	
Blaine	102	53	74.4	1.61	
Boulder	91	51	70.6	0.44	
Breckenridge	79	31	52.7	2.78	
Buena Vista	75	33	54.6	1.05	
Burlington	99	49	73.2	2.06	
Canyon	95	53	73.8	0.17	
Cascade	.....	.....	.....	6.09	
Castle Rock	95	40	66.5	0.36	
Cheesman	88	46	64.8	2.73	
Cheyenne Wells	100	49	74.2	0.95	
Chromo	82	36	58.6	4.62	
Collbran	90	45	66.7	2.03	
Colorado Springs	87	48	66.8	1.79	
Cope	99	45	73.2	2.20	
Corona	64	33	46.5	1.26	
Cripple Creek	.....	.....	.....	1.88	
Delta	95	51	71.8	1.60	
Dunkley	80	29	57.9	.....	
Eads	101	51	75.0	0.51	
Eagle	87	34	60.8	1.03	
Fort Collins	92	45	66.8	1.27	
Fort Morgan	99	49	71.7	2.99	
Fowler	.....	.....	.....	1.91	
Frances	83	37	59.9	.....	
Fruita	98	46	72.0	2.02	
Garnett	84	41	61.2	1.98	
Gladstone	.....	.....	.....	4.15	
Gleneyre	.....	.....	.....	2.20	
Glenwood	89	40	63.9	2.66	
Gothic	75	31	51.4	4.45	
Grand Valley	94	44	69.1	1.17	
Gunnison	85	35	58.8	1.79	
Hamps	92	43	66.8	1.06	
Holly	.....	.....	.....	1.05	
Holyoke	103	47	72.6	1.84	
Idaho Springs	83	42	62.2	1.81	
Lake City	78	39	58.6	3.11	
Lake Moraine	70	34	52.7	1.55	
Lamar	102	50	76.6	1.28	
Laporte	.....	.....	.....	0.73	
Las Animas	106	51	76.6	0.60	
Colorado—Cont'd.					
Lay	89	26	62.7	1.04	
Leroy	96	49	71.2	4.19	
Limon	94	48	69.3	0.81	
Longs Peak	78	28	54.0	1.65	
Lujane	88	47	67.9	1.76	
Manassa	84	40	61.1	1.59	
Mancos	87	41	63.6	3.29	
Meeker	88	33	62.6	2.57	
Nederland	.....	.....	.....	0.73	
Pagoda	87	32	61.4	2.64	
Pagosa Springs	86	36	61.0	3.31	
Paonia	94	46	70.4	1.25	
Platte Canyon	.....	.....	.....	0.57	
Power House	85	43	62.5	3.55	
Rangely	83	35	60.6	1.90	
River Portal	90	44	66.6	1.88	
Rocky Ford	96	52	73.2	0.78	
Saguache	87	42	61.2	3.69	
Salida	87	40	62.8	1.81	
San Luis	84	42	61.0	1.89	
Santa Clara	84	43	62.9	3.64	
Sapinero	80	35	57.6	2.01	
Sheridan Lake	100	50	74.3	2.24	
Silverton	77	33	54.3	3.93	
Stonewall	.....	.....	.....	4.14	
Sunflower	96	44	68.4	1.83	
Terminal Dam	.....	.....	.....	4.28	
Victor	78	44	59.2	1.42	
Vilas	.....	.....	.....	1.33	
Wagon Wheel Gap	87	31	56.1	2.81	
Waterdale	92	43	67.0	0.49	
Westcliffe	85	38	61.6	1.53	
Whitepine	70	33	51.4	2.78	
Wray	100	52	73.1	3.80	
Yuma	.....	.....	.....	2.58	
Connecticut.					
Bridgeport	92	49	70.4	1.36	
Canton	92	43	66.0	1.37	
Colchester	88	43	66.5	1.33	
Falls Village	.....	.....	.....	2.27	
Hawleyville	93	44	67.8	1.73	
New London	88	50	69.0	0.99	
North Grosvenor Dale	95	41	67.3	0.84	
Norwalk	91	44	68.6	1.48	
Southington	91	42	67.2	1.18	
Storrs	94	45	66.0	1.09	
Voluntown	94	40	67.4	1.17	
Waterbury	95	43	69.2	1.35	
West Cornwall	93	46	66.2	2.11	
West Simsbury	.....	.....	.....	1.56	
Delaware.					
Delaware City	.....	.....	.....	2.49	
Dover	92	60	74.6	3.76	
Milford	95	52	74.1	1.75	
Millsboro	92	52	72.4	5.94	
Newark	90	51	71.2	3.35	
Seaford	91	52	71.8	2.46	
District of Columbia.					
West Washington	96	55	74.6	5.06	
Florida.					
Apalachicola	92	64	82.0	12.20	
Arcadia	95	62	81.2	9.31	
Archer	95	66	80.8	4.78	
Avon Park	96	69	82.1	7.08	
Bartow	97	66	82.0	8.31	
Bonifay	96	66	81.4	8.14	
Brooksville	96	69	81.6	6.41	
Carrabelle	92	66	81.0	6.70	
Clermont	99	69	82.8	5.81	
De Funiak	98	65	81.1	9.52	
Eustis	97	68	81.8	6.78	
Federal Point	97	68	81.8	7.58	
Fenholloway	98	62	80.6	7.58	
Fernandina	97	70	81.6	3.36	
Flamingo	98	70	84.2	5.06	
Fort Meade	95	67	80.7	6.20	
Fort Myers	92	70	80.6	7.86	
Gainesville	97	68	81.5	5.55	
Galt	96	67	81.0	7.47	
Grasmere	95	71	82.3	.....	
Huntington	97	69	82.2	4.26	
Hypoluxo	93	69	82.0	4.06	
Inverness	93	68	80.6	5.06	
Jasper	95	67	81.4	7.26	
Johnstown	97	66	81.7	3.35	
Kissimmee	96	67	82.8	4.06	
Lake City	96	62	80.4	6.77	
Macclenny	96	64	80.5	5.18	
Madison	97	67	80.8	8.00	
Malabar	96[f]	68	82.4[e]	2.52	
Manatee	95	68	81.2	6.73	
Marianna	97	66	80.4	4.41	
Merritts Island	93	72	81.8	3.32	
Miami	93	72	82.5	3.60	
Molino	101	64	80.2	10.14	
Monticello	93	64	77.2	6.65	
Mount Pleasant	98[e]	65[e]	80.4[e]	5.78	
New Smyrna	98	69	81.3	2.27	

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Florida—Cont'd.					
Ocala	99	68	82.2	4.97	
Orange City	99	65	81.8	5.37	
Orlando	98	68	82.8	9.20	
Panasoffkee	95	68	80.7	8.59	
Rockwell	96[d]	69[d]	81.8[d]	6.19	
St. Andrew	94	69	81.8	3.31	
St. Augustine	95	69	81.0	5.94	
St. Leo	95	67	80.8	7.17	
Switzerland	97	67	80.8	2.78	
Tallahassee	93	67	79.4	9.94	
Tarpon Springs	94	67	80.4	5.74	
Wausau	101	66	82.0	5.20	
Georgia.					
Abbeville	.....	.....	.....	5.21	
Adairsville	91[e]	58[e]	76.2[e]	3.20	
Albany	98	64	82.0	11.64	
Allapaha	100	64	81.4	7.38	
Americus	96	66	80.6	7.15	
Athens	93	63	77.6	6.61	
Bainbridge	101	65	82.0	7.98	
Blakely	100	65	82.2	5.18	
Brunswick	100	69	82.8	2.12	
Butler	.....	.....	.....	9.01	
Camak	98	61	78.8	2.71	
Carlton	.....	.....	.....	2.25	
Carrollton	97	55	78.6	0.80	
Clayton	91	53	73.6	4.17	
Columbus	103	64	82.4	4.00	
Dahlonega	92	55	74.5	4.70	
Dawson	.....	.....	.....	9.61	
Diamond	88	52	72.2	4.04	
Dublin	.....	.....	.....	2.90	
Dudley	100	63	80.8	5.18	
Eastman	102	67	83.4	3.92	
Eatonton	100	60	80.2	3.60	
Elberton	99	61	79.2	1.73	
Experiment	95	61	79.0	5.45	
Fitzgerald	99	65	80.4	8.64	
Fleming	101	65	81.6	5.09	
Fort Gaines	93	68	80.4	5.54	
Gainesville	94	61	77.2	2.86	
Glenville	98	69	81.6	5.37	
Greenbush	93	55	76.8	2.76	
Greensboro	100	60	79.8	1.81	
Griffin	98	61	79.3	6.24	
Harrison	99	62	80.2	5.04	
Hawkinsville	105	60	82.8	4.04	
Helena	96	68	80.6	5.00	
Lisbon	104	59	81.1	2.10	
Lost Mountain	96	57	77.2	5.05	
Louisville	103	65	81.4	1.35	
Lumpkin	93	64	78.8	3.13	
Marshallville	100	63	80.2	4.23	
Mauzy	101	61	81.9	6.62	
Milledgeville	100	60	81.0	2.16	
Miller	99	62	81.0	3.65	
Montezuma	.....	.....	.....	5.20	
Monticello	99	64	80.6	1.82	
Morgan	95	67	79.7	5.02	
Newnan	99	60	79.2	2.46	
Oakdale	.....	.....	.....	2.46	
Point Peter	99	57	79.6	2.95	
Poulan	95	62	79.8	8.05	
Putnam	100	58	80.8	6.13	
Quitman	94	63	79.8	5.93	
Ramsey	95	60	79.8	2.98	
Resaca	.....	.....	.....	2.75	
Rome	98	56	79.4	3.46	
St. George	94	65	78.6	3.10	
St. Marys	99	68	82.2	5.07	
Screven	96[e]	68[e]	81.7[e]	8.79	
Talbotton	103	57	80.4	2.78	
Tallapoosa	99	53	78.2	2.19	
Toccoa	93	56	75.0	5.25	
Valdosta	99	68	84.0	2.10	
Valona	95	67	79.8	6.50	
Washington	38	61	79.0	3.26	
Way Cross	100	68	82.4	8.12	
Waynesboro	96	63	79.0	3.17	
West Point	98	60	80.8	1.21	
Woodbury	98	55	78.2	3.23	
Idaho.					
American Falls	93	31	63.4	1.21	
Blackfoot	92	31	62.2	0.96	
Bonners Ferry	95	34	59.8	2.65	
Buhl	98	43	70.0	0.37	
Burke	84	29	53.4	2.92	
Caldwell	102	36	67.0	0.08	
Chesterfield	87	22	57.9	2.10	
Dent	105	33	64.8	1.44	
Driggs	84	25	57.0	2.32	
Ellerslie	97	34	66.3	0.51	
Emmett	101	39	67.0	0.11	
Forney	94	22	56.1	2.00	
Garnett	113	42	73.0	0.33	
Grace	96	33	65.3	1.02	
Hot Springs	98	40	70.0	0.23	
Idaho Falls	92	32	62.8	4.09	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Idaho—Cont'd.					
Kellogg	97	31	59.0	2.23	
Lake	80	30	54.8	2.25	
Lakeview	88	37	59.4	2.25	
Landore	87	30	55.2	1.08	
Lardo	87	27	54.9	0.93	
Lost River	87	30	59.2	0.65	
Meadows	99	28	59.8	0.67	
Milner	96	37	66.1	0.25	
Moscow	98	36	61.8	1.00	
Mountain Home	100	34	66.4	0.18	
Murray	93	27	57.6	2.52	
Murtaugh	96	33	65.2	0.15	
Nevens Ranch	.....	.....	.....	0.40	
Oakley	95	37	67.6	1.36	
Orofino	109	38	66.2	1.04	
Paris	90	25	58.7	1.37	
Payette	103	36	68.0	0.28	
Pollock	102	41	68.6	0.59	
Porthill	93	38	60.6	2.63	
Roosevelt	78	28	51.6	2.20	
Rupert	98	36	66.6	0.62	
St. Maries	99	32	61.4	2.58	
Salem	.....	.....	.....	0.31	
Salmon	92	31	60.2	1.02	
Standrod	.....	.....	.....	2.42	
Twin Falls	96	33	65.1	0.43	
Vernon	97	30	60.5	0.77	
West Lake	.....	.....	.....	1.28	
Weston	90	29	62.8	1.05	
Illinois.					
Albion	96	54	75.8	6.98	
Aledo	92	50	71.2	5.60	
Alexander	95	50	73.5	7.78	
Antioch	94	42	69.0	3.96	
Ashton	90	46	68.4	5.31	
Astoria	91	47	70.8	6.33	
Aurora	92	45	68.7	6.72	
Beardstown	.....	.....	.....	5.54	
Benton	100	52	77.4	7.47	
Bloomington	97	49	73.1	6.25	
Bushnell	97	49	73.5	5.62	
Cambridge	96	50	72.2	6.60	
Carlinville	98	50	75.4	3.77	
Carlyle	.....	.....	.....	4.65	
Charleston	92	49	72.8	3.59	
Chester	102	58	79.2	6.26	
Cisne	102	52	76.0	5.58	
Coatsburg	95	52	74.0	7.12	
Cobden	98	55	77.5	5.41	
Colchester	96	51	73.4	5.58	
Decatur	95	49	73.2	7.36	
Dixon	94	45	69.4	5.33	
Dwight	96	48	71.4	7.30	
Equality	97	53	77.0	8.07	
Flora	96	50	74.7	4.98	
Friendgrove	91	51	73.8	6.97	
Galva	95	49	71.4	6.41	
Grafton	.....	.....	.....	3.83	
Greenville	94	54	74.8	5.97	
Griggsville	97	54	75.4	6.97	
Halfway	96	57	76.4	6.98	
Havana	98	49	75.7	6.73	
Henry	92	48	71.4	4.58	
Hillsboro	98	50	74.2	5.81	
Hoopeston	.....	.....	.....	2.08	
Joliet	91	48	69.9	4.66	
Kishwaukee	92	45	69.4	3.76	
Knoxville	96	52	72.8	5.84	
La Grange	96	41	71.0	4.28	
La Harpe	94[h]	48[h]	72.4[h]	5.10	
Lanark	93	42	68.8	5.13	
Lincoln	96	52	74.0	8.50	
Loami	.....	.....	.....	8.84	
McLeansboro	93	54	74.2	5.80	
Martinsville	99	49	74.4	3.85	
Martinton	95	47	71.2	6.62	
Mascoutah	99	50	76.5	4.50	
Minonk	94	47	71.4	3.91	
Monmouth	99	49	73.8	5.27	
Morrison	90	48	69.5	6.43	
Morrisonville	96	48	73.2	5.12	
Mount Carmel	.....	.....	.....	6.88	
Mount Vernon	100	53	76.8	6.61	
New Burnside	99	52	76.0	5.56	
Olney	98	53	74.8	6.37	
Ottawa	93[e]	51[e]	72.1[e]	4.49	
Palestine	95	50	73.5	7.32	
Pana	93	54	73.5	5.91	
Peoria	.....	.....	.....	.....	
Philo	93	48	70.8	4.03	
Pontiac	94	51	72.6	4.47	
Rantoul	95	50	71.8	6.21	
Raum	98	55	76.0	6.38	
Riley	92	47	69.0	3.55	
Robinson	97[e]	52[e]	73.6[e]	4.73	
Rockford	93	47	69.2	2.80	
Rushville	94	52	74.0	5.94	
St. Charles	95	45	69.8	4.12	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Illinois—Cont'd.					
St. John	97	53	75.8	7.48	
Streator	98	42	71.6	5.08	
Sullivan	95	50	73.6	4.04	
Sycamore	95	43	69.6	3.28	
Tilden	98	49	76.9	5.11	
Tiskilwa	92	49	70.6	5.39	
Tuscola	96	48	72.9	4.22	
Urbana	92	50	71.2	4.42	
Vernon	97	49	75.5	6.55	
Walnut	95	50	71.8	4.67	
Warsaw	.....	.....	.....	4.29	
Windsor	97	46	73.2	4.60	
Winnebago	93	46	69.0	4.09	
Yorkville	96	44	70.4	6.37	
Zion	91	45	69.2	2.43	
Indiana.					
Anderson	89	49	70.2	4.85	
Auburn	88	40	66.6	2.09	
Bloomington	91	53	73.6	3.12	
Bluffton	90	44	69.4	2.01	
Butlerville	94	48	73.4	4.00	
Cambridge City	90	45	69.6	2.90	
Columbus	95	48	73.3	2.58	
Connersville	89	41	70.6	2.94	
Delphi	94	45	70.0	3.86	
Elkhart	94	47	70.6	3.01	
Eminence	94	47	71.8	2.52	
Farmersburg	.....	.....	.....	3.94	
Farmland	87	46	68.9	4.04	
Franklin	92[g]	49[f]	72.1[g]	.....	
Greenfield	92	49	71.9	2.53	
Greensburg	92	49	72.2	1.90	
Hammond	86	45	69.6	2.76	
Holland	97	51	76.0	5.60	
Huntington	91	47	70.6	2.85	
Jeffersonville	93	54	75.0	2.97	
Judyville	91	43	73.5	2.80	
Knox	88	46	68.6	4.22	
Kokomo	93	45	69.8	4.05	
La Fayette	91	49	71.4	3.75	
Laporte	94	42	68.0	3.73	
Lima	90	43	67.6	2.69	
Logansport	95	46	71.2	6.13	
Madison	98	54	75.5	2.59	
Marengo	100	48	73.6	5.92	
Marion	92	45	70.5	3.82	
Markle	89	42	68.4	2.05	
Mauzy	90	46	70.4	2.91	
Moores Hill	92	50	73.2	3.02	
Mount Vernon	100	56	72.8	10.18	
Northfield	92	42	68.3	3.22	
Paoli	93	45	72.8	5.32	
Plymouth	88	44	68.4	3.58	
Princeton	97	50	74.8	6.55	
Rensselaer	89[e]	45[e]	69.0[e]	4.18	
Richmond	90	45	69.7	3.53	
Rochester	87	48	70.1	2.99	
Rockville	90	52	72.6	3.26	
Rome	98	52	77.2	5.83	
Salamonia	91	42	69.0	2.18	
Salem	93	47	73.8	5.36	
Scottsburg	94	53	74.7	4.52	
Shelbyville	90	48	71.8	2.13	
South Bend	90	45	69.0	3.48	
Terre Haute	94	54	74.6	3.81	
Veedersburg	93	48	72.8	2.97	
Vevay	90	56	74.0	4.40	
Vincennes	99	53	75.8	4.86	
Washington	92	51	73.2	8.36	
Worthington	95	49	74.2	5.34	
Indian Territory.					
Ada	104	67	83.0	1.33	
Ardmore	103	67	83.7	2.71	
Calvin	.....	.....	.....	0.88	
Durant	102	63	82.2	3.56	
Fairland	106	58	82.6	4.24	
Fort Gibson	.....	.....	.....	3.42	
Hartshorne	.....	.....	.....	6.63	
Healdton	102	61	81.0	2.23	
Holdenville	106	65	83.6	1.57	
Idabel	104	67	84.5	1.22	
Marlow	102	65	82.2	1.74	
Muskogee	109	63	84.9	1.44	
Okmulgee	106	60	83.9	0.65	
Pauls Valley	104	62	82.0	1.65	
Ravia	103	66	82.8	2.55	
South McAlester	105	67	85.4	2.08	
Tulsa	107	63	83.8	1.29	
Vinita	105	57	81.4	7.82	
Wagoner	108	61	85.5	1.16	
Webbers Falls	107	60	83.6	0.47	
Iowa.					
Afton	94	50	72.2	5.13	
Albia	93	49	71.8	4.25	
Algona	91	45	69.3	5.45	
Allerton	93	51	71.9	.....	
Alta	93	45	69.4	1.90	
Alton	94	42	70.8	2.83	

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
Iowa—Cont'd.					
Amana	92	48	70.7	2.20	
Ames				6.15	
Atlantic	96	42	71.6	2.56	
Audubon	93	42	71.2	2.60	
Baxter	91	46	69.7	5.85	
Bedford	94	47	73.8	3.22	
Belle Plaine	91	47	69.6	2.73	
Bloomfield	94	51	73.4	4.30	
Bonaparte	92	52	72.7	8.42	
Boone	94	49	71.4	6.71	
Britt	92	45	71.4	4.48	
Buckingham				6.08	
Burlington	97	52	73.2	6.96	
Carroll	92	44	69.1	4.25	
Cedar Rapids	94	51	71.6	4.11	
Chariton	95	48	71.7	3.89	
Clarinda	97	48	73.8	5.20	
Clear Lake	91	48	70.8	3.53	
Clinton	94	47	70.6	7.73	
Columbus Junction	92	51	72.0	4.09	
Corning	93	43	72.0	7.32	
Corydon	95	50	73.0	4.48	
Creston	92	42	70.8	3.80	
Cumberland				1.87	
Decorah	89	45	68.8	7.76	
Delaware	88	48	68.5	9.67	
Denison	95	41	71.8	9.41	
De Soto	90	48	71.0	4.68	
Dows	91	43	68.5	3.01	
Earlham	91	45	72.6	4.35	
Elkader	96	44	70.6	4.13	
Elliott	97	48	72.8	3.20	
Elma				7.37	
Estherville				3.91	
Fayette	90	43	67.8	4.18	
Forest City	91	46	68.6	3.97	
Fort Dodge	95	45	70.8	3.15	
Fort Madison				8.60	
Gilman				3.63	
Grand Meadow	88	47	68.2	5.27	
Greene	93	46	69.6	7.22	
Greenfield	92	49	71.6	5.25	
Grinnell	93	47	71.7	6.14	
Grundy Center	93	48	70.2	6.63	
Guthrie Center	92	42	71.4	3.80	
Hampton	93	48	70.3	3.69	
Hancock	91	49	72.0	2.32	
Harlan	93	45	71.4	2.71	
Hopeville	96	50	72.7	3.27	
Humbolt	92	46	69.7	3.70	
Independence	90	47	68.4	8.44	
Indianola	93	51	72.2	3.09	
Inwood	96	41	70.6	1.45	
Iowa City	96	49	72.4	2.98	
Iowa Falls	91	45	68.8	5.56	
Jefferson	94	46	72.2		
Keosauqua	94	49	72.9	7.10	
Knoxville	93	50	73.0	4.40	
Lacona				3.55	
Larrabee	94	46	71.5	1.83	
Le Claire				4.66	
Le Mars	92	42	69.8	1.09	
Lenox	92	49	72.5	3.40	
Leon	94	49	73.4	2.30	
Little Sioux	95	45	72.6	2.14	
Logan	94	44	72.2	3.40	
Maple Valley				2.52	
Marshalltown	91	45	69.8	6.64	
Mason City	91	46	69.6	5.72	
Massena	97	47	73.0	4.78	
Mount Ayr	95	50	74.0	3.12	
Mount Pleasant	93	52	73.2	4.89	
Mount Vernon	94	49	71.2	4.59	
Muscatine				5.16	
Nevada				4.59	
New Hampton	86	47	67.7	5.20	
Newton	93	50	71.9	5.41	
Northwood	89	45	68.6	4.86	
Odebolt	96	43	72.6	2.42	
Ogden	92	45	71.4	5.92	
Olin	90	47	69.9	8.74	
Onawa	95	49	73.9	3.20	
Osage	92	37	67.8	2.15	
Osceola	92	49	72.0	3.72	
Ottumwa	99	53	75.3	5.76	
Pacific Junction	94	50	73.0	2.45	
Pella	95	50	73.2	5.85	
Perry	94	47	71.6	5.71	
Plover	95[e]	43[e]	69.9[e]	3.67	
Pocahontas	94	45	70.5	2.98	
Ridgeway	94	45	69.4	7.97	
Rock Rapids	94	48	70.6	1.05	
Rockwell	95	47	71.6	2.30	
Sac City	92	46	69.1	3.11	
St. Charles	94	51	72.8	1.69	
Sheldon	95[e]	42[e]	71.6[e]	2.51	
Sibley	93	44	67.6	2.66	
Sigourney	93	50	72.2	3.57	
Iowa—Cont'd.					
Sioux Center	94	46	70.6	1.88	
Stockport	91	53	72.0	5.00	
Thurman	93	49	73.8	3.44	
Tipton	93	54	73.4	2.98	
Toledo	91	46	70.3	3.24	
Wapello	88[d]	54[d]	71.8[d]	4.59	
Washington	91	50	71.2	3.67	
Washta	95	29	70.4	2.31	
Waterloo	95	48	71.0	4.94	
Waukee	91	49	71.2	4.76	
Waverly	90	49	69.0	3.33	
Webster City	95	43	70.8	2.56	
West Bend	93	44	69.2	3.59	
Whitten	90	44	70.4	6.06	
Wilton	94	42	71.2	6.23	
Winterset	94	50	72.5	4.37	
Woodburn	94	45	71.4	3.51	
Zearing	92	44	70.2	3.73	
Kansas.					
Abilene				3.38	
Alton	109	56	80.8	2.10	
Anthony	100	60	80.0	3.22	
Ashland	101	58	78.4	3.06	
Atchison	99	54	77.0	2.63	
Baker	97	51	74.6	1.87	
Burlington	105	55	79.0	3.72	
Chapman	104	56	79.2	3.03	
Cimarron	100	54	79.8	2.69	
Clay Center	105	53	79.0	1.70	
Colby				2.67	
Coldwater	101	56	78.5	2.66	
Columbus	103	59	80.2	2.68	
Coolidge	104	49	77.0	1.62	
Cottonwood Falls	107	54	79.7	4.03	
Cunningham	105	56	79.0	3.49	
Dresden	108	54	77.4	2.78	
Eldorado	102	57	79.0	3.75	
Ellinwood	100	57	78.4	4.05	
Ellsworth	103	53	78.0	2.44	
Emporia	105	57	78.0	4.55	
Enterprise	107	57	79.4	2.70	
Eskridge	98	57	77.0	1.75	
Eureka				3.03	
Fall River	105	55	79.8	6.19	
Farnsworth	99	49	76.0	3.58	
Forest Hill	100	57	76.8	3.51	
Fort Scott	104	55	78.8	3.09	
Frankfort	101	48	78.2	2.61	
Garden City	103	49	77.0	1.62	
Garnett	99	56	77.7	3.60	
Goodland	104	54	74.5	1.90	
Greensburg	98	56	76.2	4.12	
Grenola	102	57	78.8	4.53	
Hanover	103	52	78.5	3.17	
Harrison	106	51	77.7	2.35	
Hays	104	45	76.8	3.12	
Hill City	106[e]	55[e]	78.4[e]	2.43	
Horton	98	52	76.2	1.54	
Howard	104	60	79.8	4.87	
Hoxie	103	51	76.0	3.41	
Hugoton				2.06	
Hutchinson	102	56	78.6	3.10	
Independence	105	60	81.2	3.43	
Jetmore	105	55	78.8	2.53	
Jewell	105	55	77.9	1.42	
La Crosse	103	56	78.8	1.64	
Lakin	99	51	75.0	4.97	
Larned	98	55	76.6	3.30	
Lebanon	107	55	78.7	2.14	
Lebo	103	57	78.0	3.54	
Liberal	105	56	78.6	2.19	
Macksville	98	54	76.0	3.44	
McPherson	106	56	78.6	4.95	
Madison	105	52	78.0	3.72	
Manhattan	102	55	78.1	1.86	
Manhattan Agr. College	101	56	77.4	1.94	
Minneapolis	100	56	78.0	3.74	
Moran	102	56	79.0	4.80	
Mount Hope				5.99	
Neosho Rapids				3.29	
Ness City				3.74	
Newton	105	54	78.8	4.57	
Norton	107	50	77.1	3.02	
Norwich	101	59	80.6	2.25	
Oberlin				3.01	
Olathe	94	55	75.4	3.05	
Osage City	103	53	78.2	2.59	
Oswego	104	57	80.6	3.36	
Ottawa	101	52	76.4	5.18	
Paola	100	55	77.0	5.62	
Phillipsburg	109	56	79.8	1.54	
Pleasanton	100	57	78.5	2.97	
Pratt	100	56	77.9	4.28	
Republic	99	54	77.3	3.17	
Rome	105	57	79.8	3.01	
Russell	101	58	77.2	1.92	
Salina	105	55	80.6	3.20	
Scott	100	52	75.9	2.57	
Kansas—Cont'd.					
Sedan	102	57	79.8	6.75	
Toronto	106	58	80.4	4.55	
Ulysses	103[d]	50[d]	77.6[d]	1.24	
Valley Falls	94	54	75.2	2.79	
Wakeeney	105	55	76.8	4.76	
Wakeeney (near)				3.47	
Wallace	105	48	75.0	2.21	
Walnut	106	58	81.0	4.65	
Winfield	103	57	80.5	2.59	
Yates Center	101[e]	56[e]	78.4[e]	4.12	
Kentucky.					
Alpha	89	59	75.1	5.15	
Anchorage	93	50	73.4	6.03	
Bardstown	98	52	76.6	2.50	
Beattyville	94	53	73.5	5.70	
Beaver Dam	98	52	76.0	3.62	
Berea	95	50	74.2	3.74	
Blandville	94	56	76.5	2.64	
Bowling Green	99	53	77.1	3.84	
Burnside	94	54	75.2	3.75	
Cadiz	95	53	77.4	3.65	
Calhoun	99	52	77.7	3.98	
Catlettsburg	95	55	74.5	6.58	
Earlington	97	52	76.0	5.68	
Eubank	92	50	72.3	3.70	
Falmouth				5.49	
Farmers	94	51	72.8	5.63	
Frankfort	91	53	73.6	5.22	
Franklin	96	55	77.0	3.86	
Greensburg	94	50	75.0	3.30	
High Bridge				4.38	
Hopkinsville	97	51	76.4	3.96	
Irvington	92	51	75.6	7.56	
Leitchfield	92	52	74.2	2.63	
Loretto	96	50	75.0	5.03	
Lynnville	97	53	77.8	2.64	
Marion	97	56	76.6	5.37	
Maysville	97	53	73.6	4.47	
Middlesboro	93	50	74.8	4.45	
Mount Sterling	90	54	73.3	4.31	
Owensboro	93	58	74.6	6.71	
Owenton	88	54	72.6	5.03	
Paducah	98	60	80.6	3.00	
Richmond	92	54	74.0	2.25	
St. John	94	48	73.4	3.08	
Scott	93	52	73.4	3.32	
Shelby City	99	50	73.2	2.91	
Shelbyville	89	51	72.5	4.70	
Taylorsville	92	50	74.2	3.11	
West Liberty	93	51	73.4	6.54	
Williamsburg	92	52	74.0	3.55	
Williamstown	89	51	71.5	4.77	
Louisiana.					
Abbeville	98	70	82.4	3.64	
Alexandria	105	66	85.4	2.01	
Amite	98	66	81.6	9.87	
Baton Rouge	99	64	81.8	5.17	
Burnside	94	67	81.0	8.65	
Calhoun	103	67	83.2	2.73	
Cheneyville	100	67	82.6	4.77	
Clinton	93	67	80.2	6.58	
Collinston	101	61	83.3	1.77	
Covington	99	68	82.2	5.57	
Donaldsonville	98	69	83.1	3.96	
Farmerville	101	65	83.6	4.95	
Ferriday	99	67	82.8	1.86	
Franklin	98	70	82.8	9.46	
Grand Cane	104	69	83.6	2.01	
Grand Coteau	98	69	82.6	5.87	
Houma	94	68	80.7	3.48	
Jennings	95	70	82.7	3.14	
La Fayette	96	65	81.6	4.01	
Lake Charles	98	69	82.2	4.50	
Lakeside	95	69	82.7	5.70	
Lawrence	98	70	83.0	7.27	
Libertyhill	102	67	83.4	2.01	
Logansport				0.58	
Melville	101	69[f]	84.6[e]	2.80	
Minden	104	65	83.5	3.71	
Monroe	103	70	84.4	3.50	
Morgan City				8.99	
Newellton	101[b]	67[e]	82.5[e]	1.89	
New Iberia	92	71	81.0	7.31	
Opelousas	98	69	83.2	3.98	
Plain Dealing	105	67	88.7	2.44	
Rayne	98	68	82.8	3.61	
Reserve	100	68	82.8	5.42	
Robeline	103	65	83.9	0.44	
Ruston	102	69	82.8	2.75	
St. Francisville	99	68	84.0	8.50	
Schriever	99	67	82.6	7.11	
Simmesport				3.14	
Southern University				6.23	
Sugar Experiment Station	94	70	82.8	5.47	
Sugartown	96	69	82.2	4.14	
Maine.					
Bar Harbor	87	44	63.0	2.37	
Cornish	90	42	65.1	2.06	

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Maine—Cont'd.	°	°	°	*Ins.*	*Ins.*
Danforth				4.04	
Debsconeag	90	46	64.6	2.30	
Fairfield	90	41	65.2	1.32	
Farmington	90	39	63.2	2.09	
Gardiner	91	45	64.8	1.51	
Greenville	84	37	61.8	2.68	
Houlton	85	42	64.4	3.22	
Lewiston	94	48	65.6	2.56	
Madison	89	41	64.0	2.54	
Mayfield	83	42	61.2	3.18	
Millinocket	93	40	66.1	4.04	
North Bridgton	93	44	65.8	2.10	
Oquossoc				2.31	
Orono	88	40	65.2	1.41	
Patten	88	35	62.4	5.00	
Rumford Falls	89	41	63.6	1.22	
The Forks				2.62	
Van Buren	84	38	61.2	4.40	
Winslow	91	38	64.0	0.83	
Maryland.					
Annapolis	89	58	73.4	5.01	
Bachmans Valley	89	48	70.0	4.66	
Cambridge	93	56	75.8	2.72	
Cheltenham	90	54	71.4	6.65	
Chestertown	88	54	71.8	3.73	
Chewsville	91	48	70.0	4.44	
Clear Spring	88	52	69.1	4.95	
Coleman	94	57	73.4	5.31	
College Park (Md. Ex. Sta.)	92	50	71.4	2.84	
Cumberland				2.74	
Darlington	90	53	70.8	5.52	
Deer Park	87	40	63.9	4.07	
Denton	95	50	72.2	3.76	
Easton	88	50	71.7	3.62	
Fallston	90	53	70.4	4.08	
Frederick	92	53	72.0	4.97	
Frostburg				3.24	
Grantsville	83	43	63.2	3.89	
Great Falls	93	52	71.0	5.39	
Greenspring Furnace	91	48	70.9	4.83	
Harney				2.55	
Jewell	87	57	71.9	4.51	
Keedysville	91	50	71.5	4.92	
Lake Montebello	93	53	72.2	5.16	
Laurel	91	52	71.2	2.42	
Monrovia	93	51		4.47	
Mount St. Marys College	88	55	71.2	3.94	
Oakland	84	39	63.8	3.99	
Pocomoke City	91	56	74.4	5.21	
Portobello	91	59	74.6	9.50	
Princess Anne	88	54	72.2	6.32	
Salisbury	93	53	73.8	5.05	
Solomons	91	61	75.0	4.28	
Sudlersville	94	50	72.4	1.68	
Takoma Park	89	51	70.8	4.12	
Taneytown	91	47	70.4	4.16	
Towson				4.02	
Van Bibber	89[a]	54[a]	71.6[a]	5.70	
Western Port	91	48	70.8	3.01	
Woodstock	87	53	72.7		
Massachusetts.					
Amherst	96	41	66.6	1.44	
Bedford	88	45	66.5	1.22	
Bluehill (summit)	95	49	67.3	1.47	
Chestnut Hill	99	45	70.0	1.79	
Concord	94	40	66.0	0.07	
Fall River	86	52	68.7	1.08	
Fitchburg	94	45	67.9	1.13	
Framingham	96	40	66.8	1.07	
Groton	93	42	65.1	1.50	
Hyannis				1.01	
Jefferson				1.37	
Lawrence	95	46	68.0	0.66	
Leominster				1.21	
Lowell	94	48	70.0	1.36	
Middleboro	90	40	66.5	1.47	
Monson	88	42	63.8	1.30	
New Bedford	89	53	69.5	0.00	
Plymouth	86	50	66.8	1.46	
Princeton				1.00	
Provincetown	87	53	68.1	1.59	
Somerset	96	48	72.0	1.14	
Sterling				1.05	
Taunton	89	40	66.0	1.17	
Westboro	96	45	69.0	0.90	
Weston				1.58	
Williamstown	87	43	64.0	1.25	
Winchendon				1.73	
Worcester	95	49	68.3	1.28	
Michigan.					
Adrian	90	40	68.8	1.90	
Agricultural College	90	41	65.5	2.87	
Alma	92	39	66.0	1.04	
Ann Arbor	89	42	67.6	1.06	
Arbela	93	36	67.1	0.94	
Ball Mountain	88	40	65.3	0.97	
Battle Creek	91	40	68.4	1.77	
Bay City	95	43	67.6	1.25	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Michigan—Cont'd.	°	°	°	*Ins.*	*Ins.*
Berlin	90	38	65.6	1.40	
Big Rapids	90	39	65.0	2.88	
Birchwood Beach	93	44	69.0	2.80	
Blaney	81	32	59.8	2.53	
Bloomingdale	94	43	68.2	2.15	
Calumet	83	43	61.6	2.76	
Cassopolis	87	45	69.2	2.20	
Charlevoix	88	44	65.5	2.31	
Charlotte	85	40	63.6	0.82	
Chatham	83	30	59.2	4.06	
Cheboygan	95	36	64.8	3.43	
Clinton	88	40	67.0	1.50	
Coldwater	90	40	67.9	2.96	
Concord	90	42	66.6	1.89	
Deer Park	87	39	60.2	3.56	
Detour	78	43	59.4	3.32	
Durand	96	39	68.8	0.36	
Eagle Harbor	84	44	60.1	3.57	
East Tawas				1.35	
Eloise	91	41	68.6	0.90	
Flint	91	40	65.4	1.62	
Frankfort	81	46	64.9	1.37	
Gaylord	91	42	65.1		
Grand Marais	83	42	58.1	2.48	
Grape	86	45	68.2	1.46	
Grass Lake	88	40	66.9	1.45	
Grayling	90	35	62.5	3.35	
Harbor Beach	94	42	64.0	1.35	
Harrison	96[a]	42[a]	66.6[a]	1.40	
Harrisville	90	42	63.6	1.53	
Hayes				0.60	
Highland				2.67	
Hillsdale	88	43	66.9	2.50	
Holland	91	45	67.9	3.15	
Howell[f]	89	39	68.6		
Humboldt	85	29	57.6	3.50	
Iron Mountain	88	38	64.3	1.44	
Iron River	86	33	61.6	4.04	
Ishpeming	81[b]	32[b]	69.6[b]		
Isle Royal	63	42	52.6	3.68	
Ivan	91	35	63.7	3.78	
Jackson	93	42	70.0	1.30	
Jeddo	89	42	66.2	1.04	
Kalamazoo	88	46	67.2	2.53	
Kenton	85	31	58.3	1.70	
Lake City	87	30	62.6		
Lansing	91	42	67.9	0.99	
Lapeer	92	46	67.4	2.35	
Ludington	82	43	65.4		
Mackinaw				4.00	
Mancelona	92	35	63.6	0.75	
Manistee	87	43	64.9		
Maple Ridge	86	33	60.9	3.80	
Menominee	85	43	63.8	1.78	
Montague	84	44	65.5	3.07	
Morenci	87	41	68.6	2.22	
Mount Clemens				1.21	
Mount Pleasant	92	36	62.2	1.97	
Muskegon	86	41	66.4	3.38	
Old Mission	90	45	64.6	2.72	
Olivet	88	43	66.4	1.64	
Omer	90	33	63.2		
Onaway	89	38	62.8		
Ovid	93	39	67.6	1.04	
Owosso	92	39	68.2	0.52	
Plymouth	93	40	66.0	0.58	
Port Austin	90	40	67.1		
Powers	86	34	59.5		
Roscommon	88	33	62.9	1.34	
Saginaw (W. S.)	93	43	68.1	0.50	
St. James	81	39	60.2		
St. Johns	94	40	67.8		
St. Joseph	91	50	69.0	2.12	
Saranac	93	40	67.4	5.17	
South Haven	85	43	64.0	2.11	
Stanton				3.11	
Thomaston	86	31	61.4	5.22	
Thornville	88	41	65.8	2.28	
Traverse City	92	43	67.1	1.28	
Vassar				0.75	
Wasepi	89	41	67.2	1.77	
Webberville	88	45	69.0	0.62	
West Branch	96[d]	40[d]	67.2[d]	1.00	
Wetmore	84	27	58.2	3.10	
Whitefish Point	77	40	57.2	3.61	
Woodlawn	88	31	61.0	2.43	
Ypsilanti	88	44	67.8	1.56	
Minnesota.					
Albert Lea	91	47	68.6	5.35	
Alexandria	93	40	65.5	2.57	
Angus	89	32	62.4	2.02	
Bagley	85	30	61.6	3.09	
Beardsley	95	23	66.8	1.80	
Bird Island	92	42	68.2	5.17	
Blackduck	89	30	61.2		
Caledonia	91	47	68.6	12.17	
Campbell	93	34	65.2	1.99	
Cass Lake				3.22	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Minnesota—Cont'd.	°	°	°	*Ins.*	*Ins.*
Collegeville	93	45	68.0	1.60	
Crookston	88	38	63.9	2.15	
Detroit	93	33	63.2	4.70	
Fairmount	90	47	69.6	5.56	
Faribault	91	43		3.00	
Farmington	90	46	67.2	7.54	
Fergus Falls	91	43	68.0	3.14	
Floodwood	87	31	63.4	3.57	
Fort Ripley	94	40	68.0	3.98	
Glencoe	92	44	67.2	5.01	
Grand Meadow	91	44	67.1	7.96	
Hallock	90	33	61.8	3.40	
Halstad	93	34	63.0	3.93	
Hinckley	94	36	65.6	2.54	
International Falls	86	32	60.2	5.20	
Lake Crystal	90	47	68.7	2.76	
Leech Lake	89	36	62.9	4.95	
Litchfield	90	41	67.0	4.05	
Little Falls	93	39	66.1	5.79	
Long Prairie	93	35	67.2	2.71	
Luverne	94	41	68.8	0.69	
Lynd	95	40	67.0	4.93	
McIntosh	85	34	62.8	3.02	
Maple Plain	92	42	67.4	5.45	
Milacca	98	36	65.6		
Milan	92	49	67.6	3.16	
Minneapolis*[1]	93	43	67.9	5.13	
Montevideo	96	39	69.7	4.89	
Mora	94	36	66.0	3.46	
Morris	94	42	68.3	1.00	
Mount Iron	84	34	61.6	2.47	
New London	94	42	69.4	3.94	
New Richland	94	45	70.4	4.97	
New Ulm	95	44	71.2	4.11	
Osakis	90	39	66.8	1.92	
Park Rapids	90	37	64.1	4.52	
Pine River	92	46	65.7	5.16	
Pipestone	90	44	69.6	4.93	
Pokegama Falls	90	31	63.5	3.05	
Poplar[g]	92	31	63.2		
Red Wing				4.37	
Redwood Falls	96	42	69.7	3.63	
St. Charles	90	44	67.2	5.20	
St. Cloud	95	40	67.6		
St. Peter	91	42	67.8	3.26	
Sandy Lake Dam	90	41	64.6	4.78	
Shakopee	90	45	68.3	5.76	
Stephens Mines	86	35	61.2	3.62	
Taylors Falls				3.55	
Tonka Bay				6.58	
Two Harbors	81	38	60.2	4.15	
Wabasha	95	47	69.2	6.18	
Windom	93	33	67.8	3.63	
Winnebago	93	45	69.4	3.13	
Winnebago	88	41	64.7	3.85	
Winona	87	48	67.0	6.80	
Worthington	90	40	66.8	2.89	
Mississippi.					
Aberdeen	106	63	82.6	1.87	
Agricultural College	102[c]	66[c]	83.8[c]	3.21	
Austin	102	64	82.0	3.16	
Batesville	103	63	82.8	2.16	
Bay St. Louis	96	70	81.6	5.64	
Bellefontaine	102	64	80.0	0.41	
Biloxi	97	70	82.8	3.71	
Booneville	98	61	80.5	2.29	
Brookhaven	99	66	81.9	5.70	
Canton	98	63	81.6	2.40	
Clarksdale	99	65	81.7	3.05	
Columbia				3.00	
Columbus	102	64	82.0	3.42	
Corinth	96	62	80.0	1.00	
Crystal Springs	98	68	81.8	2.38	
Duck Hill	103	60	81.2	2.45	
Edwards	99	65	82.5	3.46	
Enterprise				2.74	
Fayette	94	67	79.9	4.70	
Fayette (near)				6.05	
Greenville	101	67	82.8	0.58	
Greenwood	103	65	82.8	1.04	
Hattiesburg	99	69	82.6	4.22	
Hazlehurst	99	66	82.0	5.61	
Hernando	102	63	82.2	1.39	
Holly Springs	101	63	81.6	2.80	
Indianola	102	65	81.6	2.72	
Kosciusko	101	62	81.6	4.13	
Lake	97	64	81.0	4.83	
Lake Como	100	63	81.2	5.97	
Laurel	100	66	82.6	3.15	
Leakesville	98	68	82.3	4.53	
Louisville	99	64	80.9	6.37	
McNeill	97	66	81.4	10.48	
Macon	101	65	82.0	2.60	
Magnolia	97	66	81.4	7.70	
Monticello	99	68	82.4	4.93	
Natchez	101	67	83.8	3.11	
Okolona	103	64	82.8	0.45	
Pearlington	98	67	81.6	4.14	

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
***Mississippi*—Cont'd.**					
Pecan	97	68	81.1	9.60	
Pittsboro	101	64	80.2	2.05	
Pontotoc	100	64	80.9	2.02	
Porterville	100	64	80.8	1.48	
Port Gibson	98	65	81.4	2.08	
Quitman	100	65	81.6	5.81	
Ripley	101	60	80.3	2.30	
Shoccoe	101	62	82.2	4.05	
Shubuta				3.21	
Suffolk	96	65	81.0	4.29	
Tchula	100	65	81.3	5.48	
Tupelo	101	62	82.2	2.08	
University	102	63	81.7	1.69	
Utica	97	65	81.5	3.41	
Water Valley	103	64	82.6	2.27	
Waynesboro	98	65	81.1	2.75	
Woodville	96	67	81.8	4.95	
Yazoo City	101	65	82.7	5.88	
Missouri.					
Appleton City	101	57	80.7	3.25	
Arthur	103	55	78.4	2.81	
Avalon	98	54	76.4	3.69	
Belle	101	51	77.6	2.55	
Bethany	91	56	75.7	2.61	
Birch Tree	102	55	78.2	2.46	
Bolivar	105	55	79.4	4.06	
Brunswick	97	55	76.8	3.92	
Caruthersville	100	55	80.6	3.80	
Clinton	100	57	78.2	3.75	
Conception	94	52	73.9	2.15	
Darksville	95	53	74.2	4.37	
Dean	109	58	81.4	4.50	
De Soto	102	50	76.4	6.88	
Doniphan	104	53	79.2	4.44	
Eldorado Springs	106	57	79.8	3.34	
Fairport				2.79	
Farmington	98	53	76.0	3.83	
Fayette	94	54	75.1	4.38	
Fulton	97	50	76.8	2.64	
Gallatin				3.74	
Gano	105	52	78.3	3.24	
Goodland	96	49	75.1	5.30	
Gorin				2.11	
Grant City	96	54	74.1	2.43	
Harrisonville	102	57	77.3	4.44	
Hazlehurst				3.38	
Hermann				3.65	
Houston	103	52	78.0	1.73	
Huntsville				3.40	
Ironton	105	47	77.0	5.08	
Jackson	99	53	78.4	4.26	
Jefferson City	100	51	76.2	2.51	
Kidder	96	53	76.4	3.47	
Koshkonong	102	56	78.8	1.56	
Lamar	104	59	79.6	4.97	
Lamonte				4.35	
Lebanon	103	58	78.8	3.27	
Lexington	95	55	76.4	4.05	
Liberty	95	54	75.6	3.49	
Lockwood	102	59	79.4	2.46	
Louisiana	97	47	74.0	5.40	
Marble Hill	97	52	76.4	4.76	
Marshall	95	54	75.5	3.84	
Maryville	96	54	74.8	3.53	
Mexico	99	51	74.8	4.81	
Mountain Grove	98	56	77.0	1.83	
Mount Vernon	105[c]	56[d]	79.6[d]	6.35	
Neosho	102	55	79.8	4.99	
New Madrid				3.04	
New Palestine	98	57	78.3	4.87	
Oakfield	99	55	76.2	4.32	
Olden	104	57	78.4	2.69	
Oregon	95	54	75.7	5.92	
Osceola				4.08	
Princeton	97	52	77.2	2.58	
Rockport	94	51	76.2	3.57	
Rolla	103	54	77.7	5.49	
St. Charles	100	55	76.2	5.68	
St. Joseph				4.20	
Sikeston	97	55	77.7	3.36	
Steffenville	98	51	73.7	7.07	
Sublett	94	49	73.6	2.28	
Trenton	92	55	75.5	2.89	
Unionville	96	49	73.0	3.49	
Versailles	99	54	78.4	2.75	
Warrenton	99	53	75.4	4.83	
Warsaw	101	53	78.2	5.14	
Wheatland				3.08	
Willow Springs	103	53	78.8	2.87	
Windsor	97	55	76.0	4.31	
Montana.					
Absarokee				1.13	
Adel	84	30	57.0	1.64	
Anaconda	85	33	58.5	1.97	
Augusta	85	29	57.1	1.76	
Babb	79	29	53.2	2.23	
Billings	100	34	69.0		
Bozeman (Agr. College)	84	34	58.2	1.37	
***Montana*—Cont'd.**					
Bowen	86	20	51.4	1.81	
Broadview	98	32	65.0	0.79	
Busby	100	32	64.2	0.52	
Butte	86	34	59.0	2.20	
Canyon Ferry	90	37	62.3	1.10	
Cascade	89	34	62.4	2.68	
Chester	87	35	60.9	1.77	
Chinook	94	34	64.3	1.88	
Choteau	86	31	59.0	1.28	
Columbia Falls	90	30	57.8	4.78	
Copper				1.30	
Crow Agency	96	35	65.5	1.25	
Culbertson	99	32	64.7	2.02	
Dayton	87	32	58.0	1.20	
Decker	100	34	66.2	T.	
Dillon	85	29	59.1	2.00	
Ekalaka	99	36	67.2	1.74	
Ericson				0.93	
Fallon	105	34	65.5	0.91	
Fort Benton	90	42	64.2	2.05	
Fort Harrison	88	39	63.2		
Fort Logan				0.07	
Fort Shaw	86	37	62.2	3.03	
Fortine	86	27	55.5	2.15	
Glasgow	99	35	65.0	1.97	
Glendive	104	33	69.7	1.32	
Gold Butte	81	25	52.2	3.12	
Graham	100	33	66.7	0.35	
Grayling	79	19	50.4	1.14	
Great Falls	80	42	61.9	2.67	
Hamilton	88	38	60.5	1.51	
Highwood				2.54	
Home Park				1.42	
Huntley	98[e]	39[e]	66.4[e]	0.57	
Lake McDonell	89[d]	29[d]	56.4[d]	2.89	
Lewistown	90	31	60.0	3.24	
Livingston	92	33	63.0	1.33	
Lodge Grass	95[d]	38[d]	64.4[d]	0.83	
Missoula	92	38	62.6	1.78	
Moore				2.63	
Norris	88	36	62.8	1.00	
Nye				1.96	
Ovando	87	25	57.9	1.12	
Philipsburg	92	28	56.6	1.63	
Plains	91	34	59.2	1.05	
Pleasant Valley	87	25	53.8		
Plentywood	98	32	68.0		
Poplar	101[c]	37[e]	66.6[e]	0.42	
Raymond				2.94	
Red Lodge	87	31	58.5	1.35	
Renovo	88	29	59.1	1.27	
Ridgelawn	101	35	64.6	1.62	
Saltese				2.05	
Snowshoe	84	53	54.0	5.55	
Springbrook	100	29	64.1	2.00	
Steele	89	40	62.9	2.57	
Tokna	104	35	67.0	2.16	
Townsend				1.99	
Tosten	90	32	60.8	1.28	
Troy	98	32	59.2	1.71	
Utica	86	33	60.4	1.47	
Valentine	98	34	65.0	1.30	
Wolf Creek	88	33	61.6	0.85	
Nebraska.					
Ainsworth	104[d]	40[d]	72.3[d]	1.64	
Albion	97	35	71.1	2.05	
Alliance	102	43	71.9	1.35	
Alma	105	50	76.2	1.14	
Anoka	103	38	70.4	1.10	
Arapahoe				1.12	
Arcadia				1.49	
Ashland	96	52	74.9	2.73	
Ashton				3.57	
Atkinson	102	41	71.2	0.91	
Auburn	94	50	72.8	2.95	
Aurora	103	50	75.4	3.29	
Beatrice	96	50	76.0	2.25	
Beaver	112	52	78.3	1.32	
Bellevue	92	52	74.2	3.08	
Benkleman				2.13	
Blair	95	47	72.4	3.60	
Bloomfield	95	43	71.2	1.43	
Blue Hill				1.10	
Bradshaw				3.56	
Bridgeport	98	42	69.9	1.29	
Broken Bow	101	43	72.2	1.70	
Burchard				3.78	
Burwell				0.45	
Cambridge	109	46	76.3	1.87	
Central City				3.28	
Chester				2.81	
Columbus	97	48	72.0	6.19	
Crete	97	53	75.0	3.27	
Culbertson	102	48	72.9	2.40	
David City	93	51	72.9	1.96	
Dawson	98	53	77.2	4.22	
Du Bois				2.98	
Duff				1.80	
***Nebraska*—Cont'd.**					
Dunning	106	60	82.0	1.50	
Edgar				1.62	
Ellis				2.25	
Ericson				1.81	
Ewing	99	43	68.2	2.25	
Fairbury	101	51	77.5	3.30	
Fairmont	100	48	74.2	2.62	
Fort Robinson	100	38	68.8	1.28	
Franklin	110[e]	51[c]	79.8[e]	1.29	
Fremont	95	59	73.2	3.52	
Fullerton	100	48	74.2	3.22	
Geneva	101	50	76.0	2.59	
Genoa (near)	97	50	74.6	2.67	
Gering				2.46	
Gosper				3.47	
Gothenburg	109	46	74.4	2.38	
Grand Island	100	54	76.6	5.32	
Grant	103	45	71.2	2.46	
Greeley	100	54	74.2	2.52	
Guide Rock				2.13	
Haigler				4.00	
Halsey	106[e]	44	74.3[c]	0.82	
Hartington	98	44	70.7	1.82	
Harvard	101	48	74.4	2.19	
Hastings	99	52	75.7	2.26	
Hayes Center	102[1]	49[1]	73.2[1]	5.63	
Hay Springs	101	39	69.0	0.99	
Hebron	99	50	76.3	1.95	
Hendley				1.54	
Holdrege	108	52	76.6	3.20	
Hooper*[1]	95	42	72.8	4.10	
Imperial	104	50	73.2	4.17	
Kearney	106	48	74.2	2.95	
Kennedy[b]	102	40	69.7		
Kimball	98	43	70.1	1.61	
Kirkwood	107[d]	40[d]	72.0[d]	0.36	
Leavitt	98	47	74.2	3.79	
Lexington	102	46	74.1	1.64	
Lodgepole	95	42	68.6	2.30	
Loup	103	45	73.9	1.81	
Lynch	104	40	73.0	0.93	
McCook				3.05	
McCool				3.91	
Madison	95	48	71.4	2.90	
Marquette				3.53	
Mason				3.30	
Minden	108	51	76.6	1.86	
Monroe				2.85	
Nebraska City	95	50	74.0	2.77	
Nemaha				4.25	
Norfolk	98	45	72.0	3.96	
North Loup	102	48	74.2	2.92	
Oakdale	99	44	71.5	2.23	
Oakland	94	46	72.3	5.06	
Odell				3.44	
Ord				1.21	
Osceola	100	51	77.7	3.15	
Palmyra*[1]	96	56	75.4	3.20	
Pawnee City	98	48	75.0	3.31	
Plymouth	101	50	76.0	2.09	
Purdum	106	46	74.3	0.92	
Ravenna	106	47	75.2	4.11	
Republican				1.36	
Rulo				5.62	
St. Libory				4.28	
St. Paul	103	51	75.7	3.41	
Santee	103[d]	50[a]	76.2[c]	1.26	
Schuyler				4.39	
Scottsbluff	101	42	70.1	1.39	
Seward	98	50	75.5	3.15	
Springview	100	42	72.0	0.51	
Stanton	97	43	71.6	2.51	
Strang				2.17	
Stratton				2.20	
Superior	104	53	76.4	4.00	
Syracuse				3.37	
Table Rock				3.98	
Tecumseh	97	49	75.9	3.67	
Tekamah	95	48	72.8	2.82	
Turlington	94	51	74.2	2.91	
University Farm	96	49	74.4	4.40	
Wahoo				4.95	
Wakefield	96	44	70.3	3.75	
Watertown				2.93	
Wauneta				5.35	
Weeping Water	99	46	73.8	3.58	
Westpoint	96	45	72.4	3.03	
Wilber				2.15	
Wilsonville				1.41	
Winnebago	94	39	69.2	2.60	
Wisner				3.56	
Wymore				3.05	
York	101	51	76.6	2.95	
Nevada.					
Amos	99	31	63.4	0.31	
Austin	88	38	65.0	0.02	
Battle Mountain	96	44	68.6	0.05	
Beowawe*[1]	96	58	72.2		

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Nevada—Cont'd.	°	°	°	*Ins.*	*Ins.*
Carlin*1	89	39	62.6	0.00	
Carson Dam	95	40	69.8	0.30	
Clover Valley	89	35	62.8	1.29	
Columbia	92	41	69.8	T.	
Elko*1	95	50	64.1	0.25	
Eureka	89	34	65.6	0.63	
Fallon	99	40	69.2	0.38	
Fenelon*1	92	34	65.5	1.35	
Fernley	98	40	71.2	1.14	
Geyser	90	30	61.3	T.	
Golconda	92	39	66.6	0.00	
Halleck*1	91	32	61.5	0.10	
Hazen	96	40	71.6	0.03	
Humboldt*1	85	50	70.3	0.00	
Jean	103	67	88.0	0.37	
Leetville	100	39	69.4	0.03	
Lewers Ranch	91	34	64.2	0.20	
Las Vegas	109	50	82.2	......	
Logan	108	54	85.2	0.13	
McAfees Ranch	91	22	59.0	T.	
Mill City*1	90	40	68.9	......	
Millett	92	35	65.4		
Palmetto	88	30	62.0	0.53	
Paradise Valley	......	......	......	0.15	
Potts	91	27	62.3	0.08	
San Jacinto	91	28	61.1	1.15	
Soda Lake	......	......	......	0.20	
Squaw Valley	100	24	63.2	0.04	
Tecoma	96	33	65.9	0.00	
Verdi*1	92	46[d]	67.4[e]		
Wabuska	94	35	66.2	0.50	
Wells*1	92	38	66.3	0.00	
New Hampshire.					
Alstead	87	44	64.0	2.19	
Brookline	95	40	66.6	1.54	
Durham	95	39	65.8	1.54	
Franklin Falls	93	39	66.3	2.60	
Grafton	93	33	62.6	1.27	
Hanover	93	37	64.8	1.16	
Keene	93	36	64.6	2.34	
Nashua	96	42	68.4	1.41	
Newton	93	38	64.8	1.18	
Plymouth	93	36	64.2	1.35	
New Jersey.					
Asbury Park	86	55	69.8	4.72	
Bayonne	94	53	71.0	2.47	
Belvidere	92	47	69.6	2.79	
Bergen Point	91	51	70.9	2.53	
Beverly	93	51	71.4	4.46	
Bridgeton	95	50	73.2	2.75	
Browns Mills	93	47	70.2	3.47	
Burlington	......	......	......	4.23	
Canton	......	......	......	2.35	
Cape May C. H.	89	52	71.7	4.44	
Charlotteburg	94	40	67.4	2.05	
Clayton	93	51	71.0	5.79	
College Farm	93	48	70.2	2.79	
Culvers Lake	......	......	......	3.04	
Dover	94	45	67.5	2.99	
Elizabeth	92	54	72.2	2.17	
Englewood	92	54	71.3	2.74	
Flemington	92	49	70.6	2.95	
Friesburg	96	47	71.2	2.39	
Hightstown	92	49	70.4	2.43	
Imlaystown	94	49	71.2	4.01	
Indian Mills	94	48	71.0	5.53	
Jersey City	94	56	72.4	2.79	
Lambertville	92	50	70.4	3.00	
Layton	95	39	65.8	2.11	
Moorestown	90	51	69.8	6.48	
Newark	94	51	71.5	3.32	
New Brunswick	94	49	70.4	1.79	
Oceanic	91	54	69.8	3.21	
Paterson	95	51	71.4	3.29	
Phillipsburg	94	49	70.4	8.04	
Plainfield	92	48	70.0	2.92	
Pleasantville	......	......	......	4.05	
Rancocas	......	......	......	7.61	
Rivervale	93	39	67.2	1.98	
Runyon	......	......	......	8.00	
Somerville	95	48	71.2	2.79	
South Orange	92	50	69.6	2.46	
Sussex	92	45	68.2	1.86	
Trenton	90	54	70.9	3.74	
Tuckerton	89	49	70.8	7.58	
Vineland	95	49	71.4	2.49	
Woodbine	93	47	71.4	6.28	
New Mexico.					
Alamogordo	101	60	77.1	3.74	
Albert	102	56	76.6	3.28	
Albuquerque	98	45	73.4	1.66	
Alto	......	......	......	4.61	
Bellranch	104	69	77.8	3.16	
Bloomfield	98	48	72.3	1.46	
Cambray	......	......	......	0.60	
Carlsbad	103	61	81.4	2.81	
Chama	86	40	62.4	5.13	
Cimarron	91	47	66.4	3.56	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
New Mexico—Cont'd.	°	°	°	*Ins.*	*Ins.*
Cliff	100	57	74.9	2.86	
Cloudcroft	79	41	57.6	3.86	
Deming	109	59	84.1	1.95	
Dorsey	91	50	67.9	5.88	
Dulce	91	42	65.8	3.22	
Eagle Rock Ranch	88	50	66.6	5.53	
Elizabethtown	80	38	57.8	4.60	
Elk	92	50	69.2	5.16	
Espanola	92	49	69.4	5.94	
Estancia	95	42	68.8	4.71	
Fairview	92[e]	47[e]	68.2[e]	7.15	
Fort Bayard	95	54	72.8	4.15	
Fort Stanton	92	52	69.0	4.58	
Fort Union	86	41	64.4	5.02	
Fort Wingate	87	45	65.6	6.22	
Frisco	97[d]	53[d]	72.0[d]	4.76	
Fruitland	93	51	71.6	2.26	
Gage	97	60	76.2	2.05	
Glen	100	59	76.2	3.64	
Hillsboro	96	55	74.8	5.07	
Laguna	94	53	72.0	......	
Lagunita	96	55	73.7	4.36	
Lake Valley	......	......	......	2.97	
Las Vegas	93	48	67.8	3.30	
Logan	101	59	77.6	2.97	
Lordsburg	100	55	80.4	4.05	
Los Alamos	......	......	......	4.44	
Los Lunas	94	53	72.4	4.73	
Magdalena	88	51	68.2	3.66	
Manuelito	......	......	......	3.13	
Mesilla Park	105	61	80.2	1.42	
Mimbre's	......	......	......	3.76	
Mineral Hill	......	......	......	5.32	
Monument	100	61	79.8	0.90	
Mountain Air	95	51	69.7	4.88	
Nara Visa	99	58	70.8	3.89	
Nursery Site	85	47	63.0	3.59	
Orange	103	55	78.8	3.17	
Red River	......	......	......	6.10	
Redrock	......	......	......	5.37	
Rincon	100	57	78.8	3.24	
Rociada	82	43	61.2	6.12	
Rosa	......	......	......	3.19	
Rosedale	84	48	65.5	8.10	
San Jon	101	59	78.8	4.65	
San Rafael	90	50	68.2	7.63	
Socorro	95	50	70.4	5.41	
Springer	95	49	69.6	2.60	
Strauss	......	......	......	2.24	
Taos	92	47	65.9	5.21	
Tres Piedras	85	42	61.8	3.80	
Tucumcari	100	58	78.9	3.92	
Valley	......	......	......	3.00	
Vermejo	84	44	61.2	4.20	
Winsor	79	36	58.0	6.34	
New York.					
Adams	91	44	68.0	1.31	
Addison	98	36	66.4	0.95	
Allegany	91	34	63.7	1.11	
Amsterdam	93	43	66.3	1.29	
Angelica	91	31	62.0	1.20	
Appleton	94	44	65.7	1.89	
Athens	95	46	69.2	1.10	
Auburn	93	45	66.0	1.52	
Avon	90	44	65.2	1.57	
Baldwinsville	92	45	66.8	1.84	
Ballston Lake	90	45	65.2	1.54	
Bedford	94	44	68.7	1.40	
Bouckville	89	40	63.0	1.69	
Brockport	91	44	66.9	1.36	
Cape Vincent	85	47	66.0	1.15	
Carmel	94	48	69.0	3.03	
Carvers Falls	90	40	64.3	1.24	
Chatham	99	44	68.5	0.67	
Chazy	91	40	64.2	1.40	
Cooperstown	86	43	63.6	1.70	
Cortland	95	39	67.3	0.37	
Cutchogue	91	49	69.4	2.06	
Dannemora	92	44	64.0	0.47	
De Ruyter	87	37	63.2	2.05	
Easton	......	......	......	2.42	
Elba	88	45	64.8	1.63	
Elmira	96	40	67.5	0.85	
Fayetteville	94	43	67.2	1.44	
Fort Plain	94	45	68.7	0.55	
Franklinville	88	33	62.0	1.14	
Gansevoort	......	......	......	1.25	
Glens Falls	92	43	66.1	1.49	
Gloversville	90	40	64.1	1.81	
Greenfield	93	43	65.9	1.51	
Greenwich	89	41	65.5	1.79	
Griffin Corners	90	34	61.0	0.69	
Harkness	92	41	64.4	0.53	
Haskinville	......	......	......	1.11	
Hemlock	89	45	65.6	0.77	
Hunt	92	35	65.9	0.70	
Indian Lake	95	25	62.6	1.45	
Ithaca	93	42	66.6	1.64	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
New York—Cont'd.	°	°	°	*Ins.*	*Ins.*
Jamestown	89[d]	42[d]	65.6[d]	2.03	
Jeffersonville	95	36	64.2	1.69	
Keene Valley	94	34	62.6	1.08	
Kings Ferry	......	......	......	1.36	
Lake George	94	43	66.4	1.23	
Le Roy	87	44	65.6	1.19	
Liberty	90	43	66.0	2.09	
Little Falls City Res.	87	45	64.4	2.97	
Lockport	87	48	65.8	1.67	
Lyndonville	......	......	......	1.44	
Lyons	95	50	68.2	1.75	
Middletown	92	51	69.0	2.18	
Mohonk Lake	89	51	66.2	1.88	
Moira	92	39	65.7	1.01	
Mount Hope	94	43	68.8	2.79	
Newark Valley	......	......	......	0.94	
New Lisbon	87	35	60.4	1.38	
North Lake	85	38	60.2	0.56	
Norwich	88	40	65.0	1.30	
Ogdensburg	......	......	......	0.57	
Oneonta	93	42	66.6	0.49	
Oswegatchie	82	32	58.2	0.90	
Otto	86	48	66.4	1.73	
Oxford	88	41	64.7	1.59	
Palermo	......	......	......	0.33	
Penn Yan	96	41	67.2	0.80	
Perry City	94	33	63.7	1.71	
Philadelphia	89	40	64.5	1.59	
Plattsburg	90	42	68.4	0.90	
Port Jervis	97	44	68.2	3.88	
Rose	94	42	65.7	1.26	
Salisbury Mills	96	45	68.9	1.45	
Saranac Lake	88	32	66.0	0.94	
Scarsdale	87	47	67.1	1.27	
Setauket	87	52	69.6	1.41	
Shortsville	92	43	66.6	0.99	
Skaneateles	......	......	......	1.34	
Southampton	88	50	68.2	1.78	
South Canisteo	91	34	63.0	1.49	
Spier Falls	93	43	66.0	0.85	
Taberg	91	28	62.4	1.43	
Ticonderoga	91	45	67.0	1.11	
Volusia	85	46	64.5	0.86	
Wading River	89	42	68.1	1.94	
Wappinger Falls	92	48	68.3	1.63	
Warwick	......	......	......	2.18	
Watertown	89	44	65.3	1.43	
Waverly	97	33	66.2	1.25	
Wedgwood	95	41	65.6	1.35	
West Berne	94	38	65.1	0.84	
Westfield	85	48	65.6	1.40	
Windham	90	38	62.8	1.09	
Youngstown	......	......	......	1.66	
North Carolina.					
Beaufort	91	67	80.2	6.46	
Brevard	89	48	70.6	3.99	
Brewers	93	49	73.8	3.37	
Buck Spring	79	37	60.8	2.91	
Caroleen	95[f]	56[f]	77.0[f]	5.22	
Chalybeate Springs	95	54	76.6	6.87	
Eagletown	92	58	76.2	4.03	
Edenton	89	60	76.0	4.30	
Fayetteville	93	58	77.4	8.33	
Goldsboro	94	54	77.8	2.75	
Graham	......	......	......	3.67	
Greensboro	93	56	76.6	2.49	
Greenville	......	......	......	6.45	
Henderson	88	39	74.8	5.21	
Hendersonville	90	51	72.0	3.69	
Horse Cove	86	51	71.0	7.57	
Hot Springs	92	50	74.9	4.28	
Kinston	96	58	78.6	5.02	
Lenoir	96	49	74.9	2.03	
Lexington	98	53	77.6	1.77	
Lincolnton	83	55	70.4	2.15	
Louisburg	92	57	76.2	5.13	
Lumberton	96	58	79.0	7.46	
Manteo	90	58	76.4	6.96	
Marion	93	50	74.6	3.45	
Moncure	98	54	77.0	5.61	
Monroe	94	51	75.6	2.43	
Morganton	94	49	74.0	1.83	
Mount Airy	95	50	73.6	6.86	
Mount Holly	......	......	......	1.64	
Nashville	93	56	76.8	5.45	
New Bern	93	62	78.2	12.21	
Patterson	85	48	70.0	3.29	
Pinehurst	94	59	77.7	2.97	
Pittsboro	95	60	77.8	......	
Ramseur	97	50	77.0	2.90	
Randleman	......	......	......	3.14	
Reidsville	96	54	76.6	4.12	
Rockingham	98[e]	59[b]	80.8[e]	2.89	
Salem	93	53	75.6	3.39	
Salisbury	98	50	76.4	2.14	
Sapphire	85	43	67.5	4.09	
Saxon	95	48	72.4	3.01	
Scotland Neck	91	59	77.0	2.96	

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
North Carolina—Cont'd.	°	°	°	*Ins.*	*Ins.*
Selma	94	56	77.6	6.35	
Settle	97	48	75.0	1.41	
Sloan	92	58	77.6	3.99	
Snow Hill	92	56	77.6	4.70	
Southern Pines	96	56	78.0	3.21	
Southport	93	66	80.6	7.94	
Stateville	95	53	75.2	3.26	
Tarboro	95	57	78.2	6.96	
Vade Mecum	92[d]	45[d]	72.1[d]	......	
Waynesville	82	46	68.1	3.93	
Weldon	95	57	78.4	2.68	
North Dakota.					
Amenia	96	34	64.1	6.59	
Aplin	100	38	66.6	0.42	
Berlin	103	29	63.7	1.73	
Bottineau	96	32	61.4	2.42	
Brazil	97	36	68.0	1.35	
Buford	97	37	64.6	2.50	
Cando	94	29	61.3	0.56	
Churchs Ferry	95	35	63.5	2.63	
Coal Harbor	96[f]	34[f]	65.1[f]	0.78	
Cooperstown	92	30	64.8	3.67	
Crosby	95	33	60.8	2.32	
Dickinson	97	34	65.3	1.89	
Donnybrook	92	33	62.8	1.46	
Dunseith	94	30	63.2	2.06	
Edgeley	104	31	68.2	1.21	
Edmore	90	29	62.4	1.24	
Forman	97	38	67.2	1.00	
Fort Berthold	102	33	66.1	1.77	
Fort Yates	98	34	70.0	1.61	
Fullerton	100	31	66.4	0.92	
Gladys	96	36	62.5	1.86	
Goforth	98	31	66.4	0.52	
Grafton	90	35	63.2	1.50	
Granville	97	32	63.9	1.28	
Hannah	93	30	58.1	3.02	
Hendley	98	35	74.4	1.82	
Hillsboro	95	38	66.2	3.11	
Jamestown	100	29	66.7	1.78	
Kulm	100	32	65.6	1.99	
Lakota	88[f]	31[c]	61.6[d]	1.72	
Langdon	88	33	59.0	3.70	
Larimore	91	35	62.2	2.47	
McKinney	95	29	61.2	1.93	
Manfred	96	31	63.6	1.00	
Mayville	91	35	65.3	3.13	
Melville	103[d]	37[d]	65.8[d]	0.31	
Minot	94	33	62.9	1.42	
Minto	89	34	62.2	2.44	
Mott	102	30	66.0	1.71	
Napoleon	99	27	66.4	1.03	
New England	100	29	64.5	0.20	
New Salem	99	36	66.8	1.79	
Oakdale	98	39	65.0	1.68	
Oriska	93	40	65.8	2.74	
Palermo	98	33	61.2	2.64	
Park River	89	37	63.8	2.10	
Pembina	93	34	62.9	2.78	
Plaza	93[d]	26[d]	63.2[d]	......	
Power	97	30	66.4	0.89	
Pratt	95	29	63.6	1.49	
Steele	99	35	67.0	0.73	
Towner	98	30	64.9	2.00	
University	91	32	65.0	1.66	
Valley City	99	30	67.0	2.20	
Willow City	100	29	62.6	2.25	
Wishek	92	36	66.4	1.02	
Ohio.					
Akron	90	48	69.2	1.75	
Amesville	95	49	71.8	3.33	
Bangorville	89	46	68.6	2.55	
Bellefontaine	89	45	68.2	2.16	
Benton Ridge	89	44	69.8	1.67	
Bladensburg	92	43	68.9	1.54	
Bowling Green	89	41	68.4	1.92	
Bucyrus	91	42	68.5	1.35	
Cadiz	88	49	69.3	1.66	
Cambridge	90	46	68.3	2.82	
Camp Dennison	93	50	72.6	3.18	
Canal Dover	90	46	67.9	2.25	
Canton	88	47	67.4	2.42	
Cardington	89	44	68.0	2.47	
Circleville	93	49	70.6	3.75	
Clarington	88	50	69.9	3.44	
Clarksville	90	49	71.8	4.77	
Cleveland b	90	51	68.6	1.15	
Dayton	94	48	71.6	3.08	
Defiance	90	43	68.9	2.27	
Delaware	91	44	69.1	1.99	
Demos	86	50	69.1	2.76	
Findlay	93	46	71.0	1.48	
Frankfort	94	47	71.6	3.57	
Fremont	91	45	69.6	2.14	
Garrettsville	90	43	65.7	4.08	
Granville	89	46	69.0	2.52	
Gratiot	88	45	68.6	2.30	
Green	92	54	73.2	4.77	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Ohio—Cont'd.	°	°	°	*Ins.*	*Ins.*
Greenhill	88	40	65.4	1.39	
Greenville	89	50	70.8	3.30	
Hedges	90	44	68.6	2.08	
Hillhouse	88	44	66.2	1.09	
Hiram	88	49	67.2	3.30	
Hudson	94	43	66.7	3.04	
Ironton	93	54	73.4	7.10	
Jeffersonville	94	51	73.0	2.67	
Kenton	90	45	68.4	1.18	
Killbuck	95	45	68.7	2.22	
Lancaster	89	48	69.6	2.46	
Lima	90	47	69.5	1.76	
McConnelsville	88	49	68.6	2.75	
Marietta	90	53	71.8	3.23	
Marion	91	43	69.8	3.98	
Medina	92	42	68.9	2.25	
Milfordton	90	43	67.6	1.71	
Milligan	92	44	68.6	2.56	
Millport	89	42	66.3	1.56	
Montpelier	91	41	68.8	2.21	
Napoleon	88	45	69.6	2.62	
New Alexandria	90	48	68.8	1.54	
New Berlin	92	44	67.4	1.81	
New Bremen	93	45	70.4	1.94	
New Richmond	92	53	73.2	2.66	
New Waterford	89	41	67.2	1.77	
North Lewisburg	92	46	71.4	2.47	
North Royalton	91	46	67.4	1.35	
Norwalk	92	40	68.1	1.05	
Oberlin	95	43	69.4	0.94	
Ohio State University	90	46	70.0	4.48	
Ottawa	90	45	69.6	1.96	
Pataskala	89	46	69.3	1.89	
Philo	89	50	69.8	2.93	
Plattsburg	88	47	69.9	2.32	
Pomeroy	94	51	70.8	5.81	
Portsmouth	89	53	71.7	2.98	
Pulse	89	49	71.0	2.95	
Rittman	92	45	69.2	0.80	
Rockyridge	91	48	69.3	2.62	
Rome	92	41	66.2	0.82	
Shenandoah	89	42	67.2	2.00	
Sidney	92	46	71.2	1.80	
Somerset	93	50	70.3	2.62	
South Lorain	92	42	68.0	0.88	
Springfield	......	......	......	2.91	
Summerfield	89	46	68.0	4.53	
Thurman	90	52	71.7	3.79	
Tiffin	88	45	69.4	1.10	
Toledo (St. Johns College)	88	50	69.4	2.05	
Upper Sandusky	88	42	69.6	1.83	
Urbana	92	44	70.4	2.80	
Vickery	92	41	68.4	1.91	
Warren	92	43	67.5	2.27	
Wauseon	91	42	68.7	2.75	
Waverly	96	49	72.8	3.99	
Waynesville	89	49	69.8	4.34	
Wellington	92	43	69.6	1.14	
Willoughby	......	......	......	0.82	
Wilson	96[e]	50[e]	72.1[e]	4.03	
Wooster	90	43	68.6	2.04	
Zanesville	......	......	......	2.06	
Oklahoma.					
Alva	102	58	81.5	1.78	
Arapaho	106	61	81.2	2.66	
Blackburn	108	60	84.9	......	
Buffalo	103	60	82.2	2.91	
Cache	......	......	......	2.84	
Chandler	109	62	85.5	0.80	
Chattanooga	103	61	81.8	4.45	
Chickasha	105	63	83.2	......	
Cloud Chief	108	60	82.8	3.64	
Dacoma	101	62	80.6	2.37	
Eldorado	100	65	82.7	3.94	
Enid	106[d]	61[d]	81.2[d]	......	
Erick	103	60	80.7	3.17	
Fort Sill	101	65	81.9	2.70	
Frederick	108	65	84.4	2.70	
Gage	98	52	78.4	8.44	
Grand	96[j]	54[j]	76.5[j]	......	
Guthrie	104	63	84.0	1.09	
Harrington	98	59	76.8	4.57	
Helena	100[j]	62[j]	80.2[j]	5.10	
Hennessey	106	63	85.1	1.91	
Hobart	102	65	82.0	3.74	
Hooker	103	56	78.8	1.95	
Jefferson	100	63	81.0	3.06	
Kenton	100	54	76.0	2.29	
Kingfisher	106	61	83.5	2.30	
McComb	102	66	83.0	0.54	
Mangum	107	65	85.4	4.90	
Meeker	106	60	84.6	0.30	
Neola	100	64	82.2	3.19	
Newkirk	105	62	83.3	4.45	
Norman	101	63	82.1	1.42	
Okeene	107	62	82.5	1.50	
Pawhuska	106	60	84.0	4.07	
Perry	108	62	83.2	4.82	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Oklahoma—Cont'd.	°	°	°	*Ins.*	*Ins.*
Sac and Fox Agency	103	64	83.8	2.10	
Shawnee	107	64	84.0	0.34	
Snyder	102	62	83.4	2.33	
Stillwater	103	63	82.6	1.23	
Temple	106	66	85.0	2.63	
Watonga	102	61	81.9	1.50	
Waukomis	107	63	82.6	2.07	
Weatherford	105	63	82.4	2.30	
Whiteagle	106	61	82.9	3.59	
Oregon.					
Alba	......	......	......	1.06	
Albany	89	41	66.4	1.10	
Alpha	89	34	62.1	0.40	
Ashland	92	41	65.4	2.71	
Astoria	73	50	61.8	0.80	
Aurora (near)	87	43	63.5	1.58	
Bay City	89	40	63.0	0.17	
Bend	98	28	58.4	1.44	
Black Butte	85	40	62.6	0.39	
Blalock	106	49	72.0	0.12	
Buckhorn	92	40	64.8	1.97	
Bullrun	90	42	61.4	3.27	
Burns	95	32	60.8	0.10	
Coquille	......	......	......	0.92	
Corvallis	90	39	64.3	1.15	
Dale	......	......	......	0.52	
Dayville	99	35	64.1	0.47	
Doraville	88	41	60.7	0.97	
Drain	92	34	63.4	1.02	
Echo	103	36	67.9	0.55	
Ella	104	38	68.2	0.20	
Eugene	85	38	63.5	1.47	
Fairview	85	34	60.2	0.81	
Falls City	88	37	61.3	1.02	
Gardiner	78	42	60.0	1.23	
Glendale	94	34	62.4	1.32	
Glenora	91	37	60.2	1.70	
Gold Beach	81	42	58.2	0.58	
Granite	94	23	56.0	T.	
Grants Pass	98	35	64.8	1.76	
Grass Valley	97	28	56.3	0.71	
Heisler	100	40	66.0	2.12	
Hermiston	108	38	70.0	0.72	
Hood River	93	37	62.9	0.42	
Huntington	115	40	72.2	T.	
Jacksonville	93	40	67.5	2.22	
Joseph	93	32	58.6	0.54	
Klamath Falls	91	33	61.6	1.07	
La Grande	102	36	61.2	0.66	
Lakeview	100	30	61.4	1.74	
McKenzie Bridge	90	32	60.4	2.79	
McMinnville	89	35[g]	61.1[d]	1.40	
Marshfield	73	40	59.0	0.69	
Mill City	93	37	63.6	2.70	
Monroe	88[e]	43[e]	64.3[e]	1.25	
Mountain Park	90	42	61.8	0.90	
Mount Angel	91	45	66.2	2.50	
Nehalem	......	......	......	2.36	
Newport	81	44	37.8	1.14	
Odell	......	......	......	1.37	
Olex (near)	99	38	64.6	0.36	
Ontario	......	......	......	0.25	
Orseco	74[g]	32[g]	53.3[g]	3.19	
Paisley	87	33	60.2	0.50	
Pendleton	104	37	66.1	1.04	
Pompeii	84	32	52.2	3.11	
Port Orford	71	42	58.4	1.52	
Prineville	93	31	59.8	0.99	
Richland	102	36	67.0	0.29	
Salem	87	43	64.9	1.07	
Silver Lake	98	21	59.0	1.23	
Stafford	91	43	64.1	2.23	
The Dalles	95	45	67.5	0.74	
Toledo	89	40	60.4	1.13	
Umatilla	108	42	67.9	1.09	
Vale	108	34	68.2	0.26	
Van	......	......	......	T.	
Wallowa	100	27	59.6	0.72	
Wamic	96	28	60.0	0.98	
Weston	98	35	64.1	1.50	
Williams	95	34	65.4	1.89	
Yonna	89	28	57.6	1.38	
Pennsylvania.					
Aleppo	88	44	67.8	3.63	
Baldwin	87	43	65.7	0.88	
Bellefonte	94	40	70.8	1.96	
Browers Lock	......	......	......	4.36	
California	90	49	69.6	3.90	
Cassandra	85	43	63.6	5.82	
Center Hall	93	47	67.8	5.19	
Clarion	......	......	......	1.60	
Claysville	88	43	67.6	3.96	
Coatsville	93	50	71.5	2.64	
Confluence	......	......	......	4.32	
Coraopolis	......	......	......	1.57	
Davis Island Dam	......	......	......	1.41	
Derry	89	42	68.1	2.93	
Doylestown	......	......	......	2.37	

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Temperature. (Fahrenheit.) Minimum.	Temperature. (Fahrenheit.) Mean.	Precipitation. Rain and melted snow.	Precipitation. Total depth of snow.
Pennsylvania—Cont'd.	°	°	°	Ins.	Ins.
Drifton	85	42	63.6	2.99	
East Mauch Chunk	94	42	67.9	2.51	
Easton	88	50	70.4	3.14	
Ellwood Junction				1.40	
Emporium	89	40	65.4	1.12	
Ephrata	91	47	69.5	3.33	
Forks of Neshaminy				3.79	
Franklin	90	42	65.6	1.06	
Freeport	92	45	67.9	2.48	
George School	95	50	71.0	4.45	
Gettysburg	91	48	70.6	1.69	
Girardville				3.38	
Gordon	90	39	66.4	3.43	
Greensboro				3.66	
Greenville	89	43	66.4	1.68	
Grove City	90	41	65.7	1.08	
Hamburg	94	48	69.0	5.61	
Hanover	92	50	72.5	2.34	
Herrs Island Dam				1.78	
Huntingdon	90	43	67.2	3.37	
Hyndman	91	43	67.2	3.28	
Indiana	90	44	67.8	2.16	
Irwin	90	45	69.1	6.19	
Johnstown	90	48	68.5	4.66	
Kennett	87[c]	51	70.0[b]	4.05	
Lansdale				4.94	
Lawrenceville	96	34	65.8	0.92	
Lebanon	93	49	71.3	3.26	
Le Roy	90	46	66.2	0.77	
Lewisburg	92	44	68.8	2.94	
Lock Haven	93	45	69.2	1.76	
Lock No. 4				3.02	
Lycippus	87	49	68.2	4.25	
Marion	93	47	71.1	2.08	
Mauch Chunk				2.51	
Mifflintown	92	41	68.4	3.40	
Milford	97	40	66.8	2.33	
Montrose	94	38	64.6	0.82	
New Germantown	89	45	68.1	2.30	
Ottsville				3.82	
Parker				1.28	
Philadelphia	90	58	72.9	3.26	
Pocono Lake	89	32	61.4	2.55	
Point Pleasant				3.98	
Pottsville				4.13	
Reading	89	48	70.6	3.39	
Renovo				1.12	
Saegerstown	87	40	64.4	2.67	
St. Marys	90	39	64.6	1.37	
Saltsburg				3.28	
Seisholtzville				3.22	
Selinsgrove	90	45	69.0	3.38	
Shawmont				3.35	
Skidmore	90	43	65.1	1.30	
Smiths Corners				4.74	
Somerset	87	40	64.3	5.05	
South Eaton	89	43	66.2	1.59	
Springdale				2.85	
Springmount				4.61	
State College	88	45	66.6	3.00	
Towanda	94	39	66.6	1.13	
Uniontown	87	48	68.6	4.80	
Warren	88	41	64.7	2.24	
Wellsboro	92	33	64.9	1.17	
West Chester	92	54	71.6	2.38	
West Newton				4.34	
White Haven	89[i]	42[i]	66.4[i]		
Williamsport	89	47	69.3	0.94	
Rhode Island.					
Bristol	83	54	67.2	1.41	
Kingston	87	46	67.0	1.49	
Providence				0.90	
South Carolina.					
Aiken	98	65	79.8	5.72	
Allendale	97	68	81.6	4.57	
Anderson	101	61	78.3	4.43	
Batesburg	96	64	78.2	4.11	
Beaufort	97	70	80.7	7.20	
Bennettsville	98	58	80.0	2.20	
Blackville	101	62	81.8	4.05	
Blairs				5.38	
Bowman	98	64	80.9	7.23	
Calhoun Falls				3.29	
Camden	92	58	76.8	5.74	
Catawba				3.06	
Chappells				4.04	
Cheraw	93	58	77.7	5.13	
Clarks Hill	98	62	78.4	2.45	
Clemson College	91[c]	61[c]	76.8[c]	4.74	
Conway	97	65	80.4	8.67	
Darlington	98	58	79.6	3.51	
Dillon	96[g]	61[g]	80.3[g]	4.31	
Due West	95	65	78.8	3.66	
Edisto				6.75	
Effingham				11.40	
Florence	96	62	80.6	2.06	
Georgetown	95	68	81.1	6.51	
Greenville	93	55	73.9	5.05	
South Carolina—Cont'd.					
Greenwood	94	62	78.2	3.71	
Heath Spring	96	60	80.0	5.70	
Kingstree	94	66	80.2	8.23	
Liberty	95	60	77.6	4.35	
Little Mountain	98	65	79.4	2.99	
Newberry	98	62	80.3	5.24	
Pelzer				2.70	
St. George	94	70	81.3	5.52	
St. Matthews	92	65	77.8	3.03	
St. Stephen				10.02	
Saluda	98	58	79.4	4.02	
Santuck	97	60	78.6	3.43	
Smiths Mills				11.32	
Society Hill	92	61	78.0	6.60	
Spartanburg	97	57	77.8	4.18	
Statesburg	92	65	78.8	7.40	
Summerville	97	64	80.1	7.35	
Trenton	96	60	78.7	3.45	
Trial	94	64	78.0	8.93	
Walhalla	99	54	77.8	4.07	
Walterboro	101	64	80.8	6.18	
Winnsboro	93	64	78.6	4.62	
Winthrop College	96	60	77.4	4.32	
Yemassee	97	65	79.4	5.02	
Yorkville	96	61	79.3	7.13	
South Dakota.					
Aberdeen	99	35	67.4	1.70	
Academy	104	40	73.6	2.04	
Alexandria	98	40	71.8	0.03	
Armour	102	37[c]	72.6[b]	0.69	
Ashcroft	101	35	66.8	0.46	
Bowdle	96	41	70.0	1.60	
Brookings	99	36	69.2	1.41	
Canton	96	40	69.8	0.17	
Castlewood	95	32	67.1	0.62	
Centerville	95	43	70.5	0.99	
Chamberlain	106	42	74.3	0.37	
Cherry Creek	106	41	73.0	0.91	
Clark	93	34	68.2	0.83	
Clear Lake	93	40	66.2	1.85	
De Smet	96	38	70.7	0.05	
Elk Point	97[c]	45[c]	72.4[c]	T.	
Fairfax				0.52	
Farmingdale				0.35	
Faulkton	99	34	68.8	1.15	
Flandreau	96	41	68.0	1.54	
Forestburg	95	37	68.4	0.40	
Fort Meade	96	43	67.6	0.04	
Frederick	102[e]	30[f]	68.5[f]	0.20	
Gannvalley	102	43	72.1	0.54	
Greenwood	101	42	73.4	0.75	
Gregory				1.91	
Hermoso	98	40	69.1	1.01	
Highmore	100	38	71.6	0.28	
Hitchcock				0.31	
Howard	99	38	69.5	0.02	
Howell	101	33	69.9	0.63	
Ipswich	100	33	69.2	1.60	
Kenebec	106	42	72.8	0.33	
Kidder	95	32	66.1	0.20	
Kimball	99	45	71.6	1.18	
La Delle	95	35	71.0	1.89	
Marion	100	41	72.8	T.	
Mellette	99[b]	32[d]	70.6[e]	2.56	
Menno	99	43	71.4	0.28	
Mill Bank	96	35	67.2	1.63	
Mitchell	100	40	70.2	0.22	
Mound City	99	32	69.1	2.16	
Oelrichs	103	38	69.8	0.33	
Orman	100	43	69.0	1.07	
Plankinton	98	41	70.0	0.30	
Ramsey	97	37	68.3	0.60	
Redfield	100	34	68.4	1.60	
Rosebud	100	35	69.4	1.07	
Roslyn	91	41	67.4	4.30	
Sioux Falls	96	43	71.3	0.36	
Spearfish	93	41	66.5	1.08	
Stephan	100	40	69.6	0.24	
Watertown	91	37	66.2	0.39	
Wentworth	95	41	69.0	0.89	
Wessington Springs	96	43	70.8	0.46	
Woolsey				0.19	
Tennessee.					
Arlington	98	59	80.2	1.53	
Ashwood	95	51	77.6	3.18	
Benton	95	53	77.4	4.11	
Bluff City				4.80	
Bolivar	99	58	79.8	2.20	
Bristol	88	53	72.0	2.67	
Brownsville	100	59	80.6	1.38	
Byrdstown	91	54	75.2	4.32	
Carthage	98	54	78.2	2.44	
Cedar Hill	96	53	77.5	4.82	
Celina				3.53	
Charleston				2.90	
Clarksville	94	53	76.6	5.37	
Clinton				4.84	
Covington	100	61	80.7	2.40	
Tennessee—Cont'd.					
Dandridge				3.76	
Decatur	96	53	77.2	5.97	
Dickson	96	49	78.1	2.05	
Dover	103	51	79.8	4.13	
Dyersburg	97	59	80.3	2.69	
Elizabethton	90	52	72.9	3.58	
Erasmus	92	43	72.2	4.53	
Florence	91	54	76.8	3.51	
Franklin	95	53	77.0	2.08	
Halls Hill				4.22	
Hohenwald	94	51	77.3	4.01	
Iron City	97	53	77.4	2.02	
Jackson	100	57	80.2	1.53	
Johnsonville	98	52	79.0	2.11	
Jonesboro	87	48	72.1	2.39	
Kenton	101	56	80.2	2.65	
Kingston				2.07	
La'ayette	101	50	77.4	2.25	
Lewisburg	98	51	79.1	4.12	
Loudon				3.95	
Lynnville	94	55	77.2	4.51	
McGee				2.17	
McMinnville	99	49	76.8	1.41	
Maryville	97	52	76.8	3.19	
Milan	97	55	78.9	1.40	
Newport	90	53	74.2	3.60	
Palmetto	97	51	78.4	2.34	
Pinewood	99	48	78.2	2.15	
Rogersville	90	53	74.0	4.98	
Rugby	93	44	73.0	4.34	
Savannah	97	58	79.9	2.99	
Sevierville	93	51	75.4	3.44	
Sewanee	91	54	74.8	3.15	
Silver Lake	80	46	67.2	6.65	
Sparta	92	51	76.2	4.86	
Springdale	92	51	74.5	3.48	
Springville	96	51	77.8	5.64	
Tazewell				4.61	
Tellico Plains	95	53	76.4	5.81	
Tracy City	90	49	72.9	2.08	
Trenton	100	51	79.8	1.30	
Tullahoma	96	50	77.0	2.48	
Union City	101[g]	54[i]	80.2[h]	2.51	
Walling				3.67	
Waynesboro	95	55	78.8	2.76	
Wildersville	98	61	78.9	2.58	
Yukon	96	57	78.6	2.28	
Texas.					
Albany	106	65	86.0	0.12	
Alvin				3.85	
Arthur				1.74	
Austin	92	68	80.6	0.37	
Ballinger	102	67	85.7	T.	
Barstow	97	65	81.8	0.40	
Beaumont				4.89	
Beeville	103	71	86.1	0.50	
Big Spring	107	65	86.3	1.52	
Blanco	100	65	83.6	0.45	
Boerne	101	62	82.2	0.60	
Bonham	101	67	82.7	4.34	
Booth				2.98	
Bowie	108	63	86.5	1.94	
Brenham	98	69	84.2	2.75	
Brighton	92	70	83.6	1.30	
Brownsville	94	70	83.6	0.87	
Brownwood	104	67	86.4	0.07	
Canadian	97	60	79.1	4.14	
Carmona	102	66	84.2	2.06	
Channing	101	57	78.0	4.60	
Childress	102	61	82.1	2.90	
Clarendon	101	60	79.2	3.83	
Clarksville	105	67	84.6	2.30	
Claytonville	100	60	82.6	0.00	
Coleman	97	70	83.2	0.81	
Colorado	102	62	83.6	0.15	
Corsicana	102	72	87.4	0.00	
Crockett	105	68	85.6	0.79	
Cuero	101	72	85.7	3.29	
Dallas	104	67	85.3	0.71	
Danevang	102	70	85.0	3.40	
Decatur	100	52	78.2	0.56	
Dialville	102	68	84.6	4.00	
Dublin	102	67	85.4	0.12	
Duval	97	70	83.8	0.26	
Eagle Pass	105	72	89.2	0.00	
Earls Ranch				0.13	
Falfurrias	103	71	85.8	0.17	
Fort Clark	101	70	83.5	0.35	
Fort Davis	97	56	76.6	2.59	
Fort McIntosh	105	69	87.2	0.23	
Fort Stockton	105	62	82.8	0.89	
Fredericksburg	98	65	79.7	0.29	
Gainesville	102	68	84.2	2.75	
Gatesville	100	67	84.6	0.00	
Georgetown	101	67	85.0	0.29	
Gonzales				2.24	
Graham	110	69	89.1	0.25	
Grapevine	105[c]	68[c]	86.7[c]	0.43	

TABLE II.—*Climatological record of cooperative observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Texas—Cont'd.					
Greenville	106	69	86.2	1.50	
Hale Center	101	58	76.0	4.99	
Hallettsville	101	71	85.8	1.64	
Hebbronville				0.52	
Hempstead				6.83	
Henrietta	110	68	88.0	1.63	
Hereford	97	55	76.0	8.00	
Hillsboro	104	68	86.1	0.84	
Hondo	101	71	86.8	0.75	
Houston	102	69	84.9	3.52	
Hubbard	104	68	85.2	0.90	
Jewett	100	65	83.9	0.74	
Junction				0.57	
Kaufmann	104	71	87.6	T.	
Keene	104	63	86.3	0.22	
Kerrville	100	63	83.0	0.08	
Knickerbocker	105	63	84.7	0.21	
Kopperl				0.00	
Lampasas	102	67	83.8	0.63	
Laureles				0.31	
Liberty	102	68	83.5	3.03	
Llano	102	70	86.4	T.	
Lone Star Ranch				9.49	
Longview	104	69	85.2	1.15	
Lufkin	104	68	85.0	2.18	
Luling	99	68	84.8	0.38	
McLean	95	61	76.8	5.99	
Marfa				1.07	
Memphis	103	63	83.3	3.58	
Mexia	102	66	85.0	0.03	
Miami	98	59	78.9	3.64	
Mobeetie				0.27	
Mount Blanco	97	62	79.2	1.37	
Nacogdoches	101	67	83.2	0.15	
Nazareth	95	67	80.8	7.66	
Ochiltree				5.94	
Panter				4.60	
Paris	104	69	84.0	1.46	
Pierce				1.37	
Plemons	100	55	76.6	7.62	
Port Lavaca	96	73	84.8	1.75	
Quanah	103	67	84.0	1.55	
Rhineland	107	57	84.2	0.00	
Riverside				1.69	
Rock Island	101	69	83.7	5.56	
Rockland				2.70	
Rossville				0.51	
Runge				0.21	
Sabinal	105	69	86.4	0.02	
San Angelo	103	61	85.1	0.31	
San Antonio				0.39	
San Marcos	97	69	83.8	1.05	
San Saba	101	65	84.0	1.08	
Santa Gertrudes				2.24	
Seymour	103	69	85.0	0.07	
Sherman	98	68	84.8	3.87	
Sonora	100	52	82.1	0.24	
Sugarland	99	67	82.9	3.08	
Sulphur Springs	101	69[f]	83.7[e]	4.59	
Temple	100	64	83.9	0.17	
Texline	91	18	70.4	3.30	
Tilden	108[d]	67[d]	88.0[d]	0.21	
Tulia				8.85	
Uvalde	104[a]	70[c]	86.8[b]	T.	
Valley Junction				1.60	
Victoria	101	71	85.1	1.16	
Waco	102	70	87.8	0.25	
Waxahachie	105	64	86.6	0.56	
Wharton	102	69	84.3	1.96	
Wichita Falls	104	67	85.0	1.68	
Willis	103	67	84.4	3.29	
Wills Point	106	67	84.1	0.79	
Utah.					
Alpine				2.80	
Aneth	101	50	77.6	2.39	
Annabella				2.66	
Castle Dale	91	43	67.2	2.91	
Castle Rock				1.40	
Corinne	105	43	74.9	1.31	
Coyoto	87[f]	30[f]	59.0[f]		
Deseret	92	38	69.0	0.29	
Emery	90	41	67.0	1.91	
Escalante	90	40	66.6	1.53	
Experiment Farm				1.06	
Farmington	92	40	67.0	1.53	
Fillmore	97	40	72.2	1.23	
Fort Duchesne	96	40	67.4	0.80	
Garrison	92	34	69.1	0.05	
Government Creek	92	39	69.2	1.17	
Grayson	90	45	68.7	3.28	
Heber	90	30	63.0	0.87	
Henefer	91	28	62.4	2.43	
Hite	102	55	80.2	1.31	
Huntsville				1.17	
Ibapah	82	33	60.2	1.09	
Kanosh				1.26	
Levan	91	40	67.0	3.57	
Loa	84	38	59.0	1.80	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Utah—Cont'd.					
Logan	89	42	67.8	0.90	
Lucin	96	26	62.2	0.49	
Marion				1.01	
Marysvale	88	37	64.4	3.90	
Meadowville	86	31	60.4	1.20	
Millville				1.46	
Minersville				1.66	
Moab	99	49	74.7	1.73	
Mount Nebo	95	42	71.3	0.80	
Nephi				1.98	
Oak City	95	41	71.5	1.15	
Ogden	90	45	69.4	1.01	
Parowan	90	40	67.4	0.65	
Park City	85	30	61.0	1.80	
Payson				0.84	
Plateau	85	31	62.1	1.96	
Provo	94	40	70.1	1.95	
Ranch	84	35	60.6	0.77	
Randolph				0.83	
Richfield	95	40	69.4	0.86	
St. George	108	54	82.2	0.50	
Saltair	85	50	69.8	1.81	
Scipio	88	34	66.4	2.17	
Silver Lake	82	28	57.9	2.01	
Snowville	91	31	64.2	1.92	
Soldier Summit	82	30	56.4	0.85	
Springdale	100	53	79.4	1.46	
Sunnyside				1.97	
Theodore	90	41	66.8	1.27	
Tooele	95	47	70.0	1.43	
Torrey	97	46	69.6	3.94	
Tropic	88	39	64.0	3.48	
Trout Creek	93	34	67.2	1.56	
Wellington	121	33	75.4		
Woodruff	115	26	60.4	1.26	
Vermont.					
Bloomfield	87	35	60.6	1.92	
Cavendish	92[f]	38[f]	64.0[f]		
Chelsea	83	40	59.9	2.00	
Enosburg Falls	90	37	62.6	1.94	
Jacksonville	90	37	63.4	0.49	
Manchester	84	39	61.6	2.18	
Norwich				0.91	
St. Johnsbury	90	40	66.8	2.35	
Wells	87	42	63.7	1.20	
Woodstock	88	38	60.0	0.81	
Virginia.					
Arvonia	93	50	73.2	4.57	
Ashland	91	57	74.2	6.44	
Bigstone Gap	85	51	71.4	5.53	
Blacksburg	89	45	69.0	2.45	
Buchanan				3.86	
Burkes Garden	82	39	64.5	3.30	
Callaville	91	54	73.2	4.16	
Charlottesville	92	57	73.1	4.27	
Clarksville				2.62	
Columbia	91	55	73.4	5.79	
Culpeper	91	52	72.0	5.80	
Dale Enterprise	91	47	69.5	5.27	
Danville				0.91	
Dinwiddie	92	49	73.4	2.89	
Doswell [1]	92	54	73.8		
Elk Knob	85	51	71.0	5.08	
Fredericksburg	90	55	73.0	4.72	
Galax	87	47	71.0	2.17	
Hampton				3.25	
Hot Springs	82	46	66.6	3.35	
Ivanhoe				3.69	
Lexington	92	49	71.8	3.87	
Lincoln	94	50	73.1	4.47	
Mendota				4.61	
Newport News	94	63	77.0	4.45	
Nokesville (near)	88	50	71.2	4.08	
Petersburg	92	58	67.6	5.30	
Quantico	90	51	72.5	3.45	
Randolph				1.14	
Roanoke	91[d]	51[d]	75.0[d]	1.85	
Rocky Mount	92	50	73.1	1.90	
Shenandoah				5.16	
Speers Ferry				4.06	
Spottsville	94	55	75.0	5.57	
Staunton	89	46	71.2	3.17	
Stephens City	94	42	71.2	4.09	
Warsaw	95	54	74.4	8.36	
Williamsburg	93	56	75.0	2.87	
Woodstock	92	49	71.4	3.57	
Washington.					
Aberdeen	81	38	57.6	0.67	
Anacortes	85	40	60.3	0.26	
Baker	97	39	61.3	2.26	
Bellingham	76	38	59.9	0.99	
Cedar River				3.18	
Centralia	89	35	61.4	2.16	
Cheney	100	31	62.2	2.34	
Clearbrook	84	34	59.9	1.57	
Clearwater	83	40	61.0	2.96	
Cle Elum	98	31	59.0	0.13	
Conconully	94	38	60.4	0.47	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	
Washington—Cont'd.					
Coupeville	77	42	59.6	0.32	
Crescent	96	34	61.3	1.42	
Cusick	98	34	62.8	3.26	
Dayton	92	36	63.8	1.14	
East Sound	84	36	58.2	0.67	
Ellensburg	103	36	62.3	0.40	
Ephrata	105	45	69.0	1.60	
Fort Simcoe	100	45	67.7	0.20	
Granite Falls				2.36	
Hatton	106	31	65.5	2.89	
Hoodsport	88	42	64.0	0.54	
Huntsville				1.37	
Kennewick	106	42	69.6	0.74	
Kiona	103	41	68.4	0.41	
Kosmos	89	38	62.0	2.87	
Lacenter	89	41	61.2	1.94	
Lakeside	95	45	67.6	0.56	
Lester	93	31	60.0	1.05	
Lucerne	92	49	66.8		
Mottinger Ranch	108	43	72.0	0.71	
Mount Pleasant	94	45	63.3	2.28	
Moxee	105	37	65.6	0.67	
Northport	94	30	59.4	3.68	
Odessa	104	40	64.7		
Olga	76	44	58.2	1.22	
Olympia	83[g]	40[g]	62.4[g]	1.03	
Pinehill	95	40	65.8	0.28	
Pomeroy	100	37	64.3	0.99	
Quiniault	85	40	61.4	3.41	
Ritzville				1.30	
Rock Lake				1.54	
Rosalia	97	35	60.5	2.43	
Sedro-Woolley	79	49	60.2	1.72	
Sixprong	101	43	68.8	0.62	
Snohomish	78	40	58.8	1.95	
Snoqualmie	89[e]	41	62.8[e]	2.49	
Stehekin	95	45	64.8	0.65	
Touchet	104	41	69.0	0.72	
Trinidad	108	48	75.4	0.10	
Twisp	101	37	64.4	0.08	
Vancouver	93	44	65.5	1.38	
Vashon	80	43	61.6	0.76	
Wahluke	108	47	70.0	2.11	
Waterville	97[a]	36[b]	60.6[e]	0.70	
Wenatchee (near)	97	45	64.3	0.36	
Wilbur	100	35	60.2	1.88	
Yale	96	38	64.2	2.18	
Zindel	109	44[e]	74.3	0.50	
West Virginia.					
Bancroft	92	54	72.4	10.12	
Bayard	85	41	64.5	4.60	
Beckley	84	41	67.0	4.86	
Bens Run	90	54	71.0	4.24	
Burlington	91	44	68.2	2.68	
Cairo	93	50	71.7	4.41	
Central	89	46	68.2	4.32	
Charleston	88	56	72.5	7.12	
Creston	89	51	69.5	4.49	
Cuba	89	49	69.2	6.13	
Davis				4.59	
Doane	92	51	72.5	6.97	
Elkhorn	87	50	69.8	4.18	
Fairmont	90	48	70.2	6.15	
Franklin	88[b]	45[b]	67.4[b]	3.78	
Glenville	91	53	72.0	5.81	
Grafton	88	48	68.6	5.61	
Green Sulphur Springs	87	49	70.2	4.30	
Harpers Ferry				3.70	
Hinton				4.44	
Huntington	91	54	72.3	6.16	
Leonard	80	51	67.4	4.25	
Lewisburg	89	47	69.0	3.38	
Logan	90	54	72.4	7.55	
Lost City	88	48	69.0	3.11	
Lost Creek	88	47	68.5	6.27	
Madison	92	55	72.8	6.04	
Mannington	89	47	68.4	3.58	
Martinsburg	92	50	70.2	4.50	
Mo[illegible]efield	92	45	70.4	3.40	
Mooresville				3.04	
Morgantown	87	49	69.0	2.62	
Moundsville	91	51	71.2	2.68	
New Cumberland	90	46	67.2	2.14	
New Martinsville				2.70	
Nuttallburg	85	47	64.8	2.93	
Oceana	90	54	72.7	5.29	
Parsons	86	47	66.5	2.00	
Philippi	88	47	68.4	5.13	
Pickens	84	44	64.8	6.83	
Point Pleasant	91	55	73.3	3.74	
Princeton	79	45	64.9	4.10	
Romney	93	48	70.4	3.22	
Rowlesburg				5.69	
Ryan	89	50	70.1	6.72	
Smithfield	91	49	71.6	5.49	
Spencer	86	47	68.0	7.73	
Sutton	92	50	72.1	5.10	
Terra Alta	85	44	65.7	5.70	

TABLE II.—*Climatological record of cooperative observers*—Continued. *Late reports for July, 1907.*

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
West Virginia—Cont'd.	°	°	°	*Ins.*	*Ins.*
Union	86	45	68.9	2.97	
Uppertract	90	46	68.4	2.82	
Valley Fork	90	52	71.4	4.35	
Webster Springs	89	49	70.4	6.69	
Wellsburg	83	50	67.7	1.55	
Weston	90	50	68.4	5.36	
Wheeling	.....	.....	.....	1.86	
Williamson	93	51	74.4	4.60	
Woodbine	83	48	66.3	5.95	
Wisconsin.					
Appleton	89	45	67.0	4.20	
Appleton Marsh	89	39	65.4	6.83	
Ashland	90[e]	42[e]	65.1[e]	3.47	
Barron	90	40	65.9	2.50	
Brodhead	91	45	68.7	4.21	
Burnett	86	44	65.8	3.53	
Cecil	91	41	65.4	2.08	
Chilton	87	43	66.6	3.86	
Citypoint	92	37	64.5	4.72	
Cranden	85	38	62.4	1.91	
Delaven	91	45	69.0	3.33	
Downing	90	38	65.9	4.71	
Eau Claire	90	45	68.0	5.68	
Florence	86[e]	34[e]	62.4[e]	2.26	
Fond du Lac	86	44	66.0	3.63	
Grand Rapids	90	40	66.2	3.46	
Grand River Locks	.....	.....	.....	6.65	
Grantsburg	93	37	65.2	2.44	
Hancock	89	45	66.0	5.18	
Hayward	90	35	63.7	2.28	
Herbster	86	39	61.1	4.51	
Hillsboro	91	39	65.5	5.93	
Koepenick	84	33	60.6	1.70	
Lake Mills	89	46	66.8	5.05	
Lancaster	90	46	67.4	6.09	
Manitowoc	85	45	63.8	2.73	
Mauston	86	44	65.5	4.53	
Meadow Valley	91	41	65.6	6.40	
Medford	92	40	66.7	3.45	
Menasha	.....	.....	.....	2.44	
Merrill	85	39	63.6	4.11	
Minocqua	85	43	64.0	2.72	
Mount Horeb	87	44	67.3	3.84	
Neillsville	92	40	66.4	5.06	
New London	88	45	66.2	5.26	
New Richmond	93	42	67.6	4.37	
Oconto	89	42	65.5	2.52	
Osceola	95	34	65.8	2.98	
Oshkosh	88	45	67.1	4.69	
Pine River	87	45	65.8	4.01	
Portage	86	47	67.0	6.14	
Port Washington	85	46	64.6	5.32	
Prairie du Chien	91	47	69.6	6.22	
Prentice	89	33	61.5	2.95	
Racine	89	48	67.8	4.06	
Sheboygan	90	47	66.0	2.36	
Shullsburg	89	47	68.4	5.78	
Solon Springs	91[d]	35[d]	64.2[d]	5.34	
Spooner	90	40	65.2	3.04	
Stanley	88	40	64.4	3.59	
Sturgeon Bay	87	39	61.8	5.97	
Valley Junction	88	40	65.2	7.40	
Viroqua	87	45	67.2	5.62	
Watertown	87	45	65.8	2.85	
Waukesha	89	44	66.2	4.08	
Waupaca	91	41	66.8	5.07	
Wausau	86	40	64.9	4.71	
Weyerhauser	87	35	62.9	2.24	
Wyoming.					
Barnum	.....	.....	.....	0.26	
Barrett	79	25	52.2	1.69	
Basin	101	40	70.3	0.08	
Bedford	82	25	55.8	2.96	
Blue Cap	82	27	57.5	1.97	
Border	88	20	57.2	2.01	
Buffalo	95[1]	39	67.0[e]	0.23	
Camp Colter	96	39	66.8	0.92	
Chugwater	95	36	66.2	0.75	
Clark	94	44	67.3	0.67	
Clear Creek Cabin	86	30	57.6	0.67	
Daniel	80	22	52.8	1.86	
Dubois	87	20	55.4	1.35	
Elk Mountain	.....	.....	.....	1.07	
Embar	92	37	66.2	0.79	
Etons Ranch	96	39	67.4	0.70	
Evanston	85	27	58.7	1.50	
Experiment Farm	.....	.....	.....	1.92	
Fayette	82	23	55.2	2.26	
Fontenelle	82	22	54.8	.....	
Fort Laramie	100	42	71.1	1.89	
Granite Canyon	84	34	60.1	1.64	
Granite Springs	89	38	64.4	1.85	
Green River	90	30	62.8	0.5i	
Griggs	93	33	65.6	1.60	
Hatton	.....	.....	.....	0.85	
Hyattville	96	37	64.6	.....	
Kirtley	94	38	66.2	1.18	
Laramie	84	34	61.5	1.28	
Wyoming—Cont'd.					
Leo	87	27	62.0	0.23	
Lolabama Ranch	80	26	53.6	3.44	
Lusk	93	38	64.8	2.42	
Moorcroft	104	37	66.8	0.81	
Moore	91	35	64.9	0.89	
Newcastle	101	42	69.3	1.85	
Pathfinder	93	38	68.0	0.20	
Phillips[e]	94	35	65.1	.....	
Pine Bluff	99	39	68.8	1.26	
Pinedale	85	23	55.2	1.46	
Rawlins	87	34	63.9	0.82	
Riverton	98	58	66.2	0.27	
Saratoga	85	31	59.4	0.38	
Sheridan	97	34	63.4	T.	
Shoshone Dam	91	43	65.8	0.63	
South Pass City	80	18	50.6	0.70	
Wells	75	18	48.8	1.51	
Wheatland	97	46	72.9	0.93	
Wyncote	99	39	69.4	2.45	
Yellowstone Pk. (Fount.)	78	22	52.0	1.26	
Yellowstone Pk. (G. Can.)	80	25	51.0	1.57	
Yellowstone Pk. (Norris)	80	33	54.6	1.15	
Yellowstone Pk. (Riv'side)	.....	.....	.....	1.22	T.
Yellowstone Pk. (S. River)	90	22	54.1	0.94	
Yellowstone Pk. (Soda B.)	83	18	52.0	1.36	T.
Yellowstone Pk. (T. Sta.)	77	26	51.7	1.74	0.5
Yellowstone Pk. (Up. Ba.)	89	21	55.1	1.71	
Porto Rico.					
Adjuntas	85	61	73.6	3.38	
Aguirre	97	68	82.2	1.97	
Aibonito	90	58	75.6	1.65	
Alto de La Bandera	85	64	74.7	5.37	
Anasco	94	66	80.1	20.70	
Arecibo	90	60	76.2	6.63	
Barros	90	62	76.7	3.05	
Bayamon	96	65	78.0	5.26	
Caguas	97	63	79.2	4.26	
Canovanas	91	72	81.0	7.76	
Cayey	89	58	75.3	1.53	
Cidra	91	65	78.2	2.42	
Corozal	.....	.....	.....	0.25	
Culebra	88	73	80.5	1.28	
Fajardo	91	70	82.4	3.06	
Guanica	95	67	81.3	0.30	
Guayama	.....	.....	.....	1.77	
Hacienda Colosa	92	66	79.1	13.30	
Humacao	90	71	79.6	3.32	
Ingenio	.....	.....	.....	5.66	
Isabela	92	67	80.4	6.92	
Isolina	90	62	75.8	7.21	
La Carmelita	89	64	75.8	9.02	
Lares	92	60	76.8	10.80	
Las Marias	90	60	75.4	13.16	
Manati	95	66	80.3	4.59	
Maricao	90	61	75.2	9.38	
Maunabo	92	72	82.9	4.74	
Mayaguez	94	64	78.4	10.41	
Morovis	93	62	77.4	10.65	
Ponce	94	70	81.6	0.95	
Rio Blanco	89	67	78.6	9.83	
Rio Piedras	.....	.....	.....	6.47	
San German	94	65	79.9	3.26	
San Lorenzo	92	60	76.7	1.33	
San Salvador	89	62	70.3	4.00	
Santa Isabel	93	70	81.2	0.71	
Vieques	94	71	82.0	2.43	
Yauco	92[4]	65[4]	79.0[4]	3.53	
New Brunswick.					
St. John	72	48	59.4	4.07	
Nicaragua					
Bluefields	87	72	79.0	31.03	

Late reports for July, 1907.

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Alaska.					
Black Point	.....	.....	.....	1.94	
Central	.....	.....	.....	1.40	
Coal Harbor	70	37	51.8	4.71	
Dutch Harbor	.....	.....	.....	2.11	
Fort Egbert	.....	.....	.....	1.48	
Holy Cross Mission	68	35	53.6	3.73	
Katalla	78	43	55.2	13.96	
Kenai	69	31	48.2	5.49	
Leland's Camp	.....	.....	.....	1.79	
Sunrise	72	39	52.7	4.62	
Tyonok	69	41	54.2	6.39	
Wood Island	71	43	54.8	0.35	
Arizona.					
Parker	119	57	90.4	1.57	
California.					
Blocksburg	94	45	67.0	0.07	
Crockers	.....	.....	.....	0.00	
La Porte	86	38	60.2	T.	
Milo	.....	.....	.....	0.00	
Colorado.					
Cascade	.....	.....	.....	3.05	
Florida.	°	°	°	*Ins.*	*Ins.*
Galt	100	58	81.2	10.73	
Idaho.					
Garnet	106	48	76.3	0.17	
Iowa.					
Burlington	92	58	75.0	7.87	
Knoxville	92	56	76.0	6.66	
Maine.					
Rumford Falls	95	49	68.2	3.53	
Michigan.					
Adrian	90	44	71.6	2.44	
Allegan	88	41	69.9	.....	
Mt. Clemens	96	40	68.8	3.16	
St. James	80	42	64.6	1.13	
Minnesota.					
Bird Island	91	46	69.9	2.08	
Glencoe	89	48	69.5	2.85	
New Jersey.					
Runyon	.....	.....	.....	3.09	
New York.					
Lyons	93	46	73.7	3.31	
North Dakota.					
Hendley	95	42	68.0	6.25	
Lakota	85	44	65.5	3.98	
Oregon.					
Warmspring	100	43	69.8	0.38	
South Carolina.					
Winthrop College	100	64	80.2	4.85	
Texas.					
Santa Gertrude	.....	.....	.....	3.25	
Utah.					
Deseret	95	43	72.3	0.04	
Washington.					
Hoodsport	101	42	65.5	1.08	
Wyoming.					
Fayette	82	29	58.6	0.68	

EXPLANATION OF SIGNS.

[e] Extremes of temperature from observed readings of dry thermometer.

A numeral following the name of a station indicates the hours of observation from which the mean temperature was obtained, thus:

[1] Mean of 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. + 4.
[2] Mean of 8 a. m. + 8 p. m. + 2.
[3] Mean of 7 a. m. + 7 p. m. + 2.
[4] Mean of 6 a. m. + 6 p. m. + 2.
[5] Mean of 7 a. m. + 2 p. m. + 2.
[6] Mean of readings at various hours reduced to true daily mean by special tables.

The absence of a numeral indicates that the mean temperature has been obtained from daily readings of the maximum and minimum thermometers.

An italic letter following the name of a station, as "Livingston *a*," "Livingston *b*," indicates that two or more observers, as the case may be, are reporting from the same station. A small roman letter following the name of a station, or in figure columns, indicates the number of days missing from the record; for instance, "n" denotes 14 days missing.

No note is made of breaks in the continuity of temperature records when the same do not exceed two days. All known breaks of whatever duration, in the precipitation record receive appropriate notice.

CORRECTIONS.

June, 1907.

Utah: Logan, make precipitation 2.44.

July, 1907.

New Mexico: Datil, make mean temperature 67.3.

TABLE III.—*Wind resultants, from observations at 8 a. m. and 8 p. m., daily, during the month of August, 1907.*

Stations.	Component direction from— N.	S.	E.	W.	Resultant. Direction from—	Duration.
	Hours.	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
New England.						
Eastport, Me	17	28	4	28	s. 65 w.	26
Portland, Me	15	21	6	30	s. 76 w.	25
Concord, N. H.†	14	5	11	11	n.	9
Burlington, Vt.†	6	17	6	10	s. 20 w.	12
Northfield, Vt	20	29	3	23	s. 66 w.	22
Boston, Mass	15	20	5	30	s. 79 w.	26
Nantucket, Mass	14	25	13	28	s. 54 w.	19
Block Island, R. I	15	25	12	27	s. 56 w.	18
Providence, R. I	15	20	7	32	s. 79 e.	26
Hartford, Conn	21	26	6	20	s. 70 w.	15
New Haven, Conn	25	22	11	17	n. 63 w.	7
Middle Atlantic States.						
Albany, N. Y	20	27	6	20	s. 63 w.	15
Binghamton, N. Y.†	11	4	11	12	n. 8 w.	7
New York, N. Y	17	23	15	19	s. 34 w.	7
Harrisburg, Pa	23	14	16	22	n. 34 w.	11
Philadelphia, Pa	22	20	15	19	n. 63 w.	4
Scranton, Pa	24	19	14	19	n. 45 w.	7
Atlantic City, N. J	20	22	13	22	s. 77 w.	9
Cape May, N. J	19	26	18	10	s. 49 e.	11
Baltimore, Md	24	13	15	24	n. 39 w.	14
Washington, D. C	23	19	16	19	n. 37 w.	5
Lynchburg, Va	22	14	16	20	n. 34 w.	7
Mount Weather, Va	21	14	15	28	n. 62 w.	15
Norfolk, Va	13	29	22	12	s. 32 e.	19
Richmond, Va	26	24	14	9	n. 68 e.	5
Wytheville, Va	8	12	13	35	s. 80 w.	22
South Atlantic States.						
Asheville, N. C	36	16	19	10	n. 33 e.	17
Charlotte, N. C	16	22	21	19	s. 18 e.	6
Hatteras, N. C	11	20	19	25	s. 34 w.	11
Raleigh, N. C	24	20	8	21	n. 73 w.	14
Wilmington, N. C	14	21	16	28	s. 60 w.	14
Charleston, S. C	10	26	11	28	s. 47 w.	23
Columbia, S. C	15	25	20	20	s.	10
Augusta, Ga	14	28	18	15	s. 12 w.	14
Savannah, Ga	9	21	7	30	s. 62 w.	26
Jacksonville, Fla	4	35	16	22	s. 11 w.	32
Florida Peninsula.						
Jupiter, Fla	6	26	22	24	s. 6 w.	20
Key West, Fla	10	14	41	5	s. 84 e.	36
Tampa, Fla	19	15	23	21	n. 27 e.	4
Eastern Gulf States.						
Atlanta, Ga	20	16	14	26	n. 72 w.	13
Macon, Ga.†	6	14	7	10	s. 21 w.	8
Thomasville, Ga	6	30	25	21	s. 9 e.	24
Pensacola, Fla.†	11	8	6	17	n. 75 w.	11
Anniston, Ala	19	29	20	11	s. 42 e.	13
Birmingham, Ala	16	15	16	23	n. 82 w.	7
Mobile, Ala	10	32	4	27	s. 46 w.	32
Montgomery, Ala	9	26	15	25	s. 30 w.	20
Meridian, Miss	12	25	8	30	s. 60 w.	26
Vicksburg, Miss	8	23	12	25	s. 41 w.	20
New Orleans, La	10	21	12	30	s. 59 w.	21
Western Gulf States.						
Shreveport, La	7	35	31	7	s. 41 e.	37
Bentonville, Ark.†	2	22	8	1	s. 19 e.	21
Fort Smith, Ark	8	20	37	5	s. 69 e.	34
Little Rock, Ark	12	33	18	15	s. 8 e.	21
Corpus Christi, Tex	0	47	32	0	s. 34 e.	57
Fort Worth, Tex	5	40	25	6	s. 28 e.	40
Galveston, Tex	3	46	15	11	s. 5 e.	43
Palestine, Tex	4	48	7	18	s. 11 w.	45
San Antonio, Tex	2	39	42	0	s. 49 e.	56
Taylor, Tex.†	0	26	2	4	s. 4 w.	26
Ohio Valley and Tennessee.						
Chattanooga, Tenn	15	19	15	27	s. 72 w.	13
Knoxville, Tenn	22	17	27	13	n. 70 e.	15
Memphis, Tenn	17	25	16	21	s. 32 w.	9
Nashville, Tenn	22	13	15	19	n. 24 w.	10
Lexington, Ky.†	5	12	9	9	s.	7
Louisville, Ky	25	19	14	18	n. 34 w.	7
Evansville, Ind.†	11	8	10	5	n. 59 e.	6
Indianapolis, Ind	24	19	22	14	n. 58 e.	9
Cincinnati, Ohio	25	12	21	17	n. 17 e.	14
Columbus, Ohio	20	21	19	16	s. 72 e.	3
Pittsburg, Pa	26	20	9	26	n. 71 w.	8
Parkersburg, W. Va	22	22	14	19	w.	5
Elkins, W. Va	18	15	12	24	n. 76 w.	12
Lower Lake Region.						
Buffalo, N. Y	16	21	15	25	s. 63 w.	11
Canton, N. Y.†	2	15	4	18	s. 47 w.	19
Oswego, N. Y	16	28	9	21	s. 45 w.	17
Rochester, N. Y	19	18	8	31	n. 88 w.	23
Syracuse, N. Y	10	28	4	31	s. 56 w.	32
Erie, Pa	11	21	14	22	s. 39 w.	13
Cleveland, Ohio	19	23	21	15	s. 56 e.	7
Sandusky, Ohio†	5	11	8	13	s. 40 w.	8
Toledo, Ohio	18	23	12	24	s. 67 w.	13
Detroit, Mich	13	22	15	19	s. 24 w.	10
Upper Lake Region.						
Alpena, Mich	18	22	5	31	s. 81 w.	26
Escanaba, Mich	17	26	7	23	s. 61 w.	18
Grand Haven, Mich	18	19	17	21	s. 76 w.	4
Grand Rapids, Mich	20	22	16	17	s. 27 w.	2
Houghton, Mich.†	7	4	11	14	n. 45 w.	4
Marquette, Mich	16	19	11	29	s. 81 w.	18
Port Huron, Mich	22	20	17	14	n. 56 e.	4
Sault Ste. Marie, Mich	16	12	18	30	n. 72 w.	13
Chicago, Ill	18	23	20	17	s. 31 e.	6
Milwaukee, Wis	16	18	17	25	s. 76 w.	8
Green Bay, Wis	9	29	16	22	s. 17 w.	21
Duluth, Minn	24	11	19	27	n. 69 w.	9
North Dakota.						
Moorhead, Minn	23	21	17	21	n. 63 w.	4
Bismarck, N. Dak	25	13	15	22	n. 30 w.	14
Devils Lake, N. Dak	14	16	19	24	s. 68 w.	6
Williston, N. Dak	19	20	12	31	s. 84 w.	9
Upper Mississippi Valley.						
Minneapolis, Minn.*	6	14	8	8	s.	8
St. Paul, Minn	17	26	17	15	s. 13 e.	9
La Crosse, Wis.†	6	19	2	7	s. 24 w.	12
Madison, Wis	14	25	13	21	s. 36 w.	14
Charles City, Iowa	15	27	16	21	s. 23 w.	13
Davenport, Iowa	18	16	21	21	n.	2
Des Moines, Iowa	13	29	19	19	s.	16
Dubuque, Iowa	21	27	11	16	s. 40 w.	8
Keokuk, Iowa	17	24	18	13	s. 36 e.	9
Cairo, Ill	17	21	20	14	s. 56 e.	7
La Salle, Ill.†	10	6	12	11	n. 14 e.	4
Peoria, Ill	17	23	18	12	s. 45 e.	8
Springfield, Ill	13	23	18	19	s. 6 w.	10
Hannibal, Mo.†	8	11	10	12	s. 34 w.	4
St. Louis, Mo	12	25	21	15	s. 25 e.	14
Missouri Valley.						
Columbia, Mo.*	5	11	13	6	s. 49 e.	9
Kansas City, Mo	13	34	17	5	s. 30 e.	24
Springfield, Mo	9	37	17	13	s. 8 e.	28
Iola, Kans.†	3	19	11	3	s. 27 e.	18
Topeka, Kans.*	4	19	11	3	s. 28 e.	17
Lincoln, Nebr	16	26	28	6	s. 66 e.	24
Omaha, Nebr	16	29	19	9	s. 38 e.	16
Valentine, Nebr	17	25	13	16	s. 21 w.	8
Sioux City, Iowa†	9	12	14	4	s. 73 e.	10
Pierre, S. Dak	20	17	27	16	n. 76 e.	12
Huron, S. Dak	14	30	22	14	s. 27 e.	18
Yankton, S. Dak.†	4	13	10	9	s. 6 e.	9
Northern Slope.						
Havre, Mont	18	11	13	33	n. 71 w.	21
Miles City, Mont	28	4	20	23	n. 7 w.	24
Helena, Mont	7	19	8	41	s. 70 w.	35
Kalispell, Mont	13	13	10	36	w.	26
Rapid City, S. Dak	......	......	......	......	......	......
Cheyenne, Wyo	19	20	4	31	s. 88 w.	28
Lander, Wyo	19	19	8	33	w.	25
Sheridan, Wyo	8	35	26	6	s. 37 e.	34
Yellowstone Park, Wyo	9	40	1	27	s. 40 w.	40
North Platte, Nebr	14	30	28	7	s. 53 e.	26
Middle Slope.						
Denver, Colo	12	34	4	21	s. 38 e.	28
Pueblo, Colo	22	12	16	26	n. 45 w.	14
Concordia, Kans	8	35	26	6	s. 37 e.	34
Dodge, Kans	9	31	38	2	s. 59 e.	42
Wichita, Kans	10	34	27	4	s. 41 e.	33
Oklahoma, Okla	7	49	15	......	s. 20 e.	45
Southern Slope.						
Abilene, Tex	3	48	16	1	s. 18 e.	47
Amarillo, Tex	4	51	8	2	s. 7 e.	47
Del Rio, Tex†	1	1	29	......	e.	29
Roswell, N. Mex	23	18	12	22	n. 63 w.	11
Southern Plateau.						
El Paso, Tex	17	12	29	19	n. 63 e.	11
Santa Fe, N. Mex	21	14	29	10	n. 70 e.	20
Flagstaff, Ariz	25	18	3	27	n. 74 w.	25
Phoenix, Ariz	14	14	31	14	e.	17
Yuma, Ariz	5	30	13	29	s. 32 w.	30
Independence, Cal	13	24	20	18	s. 13 e.	9
Middle Plateau.						
Reno, Nev	7	10	4	30	s. 83 w.	26
Tonopah, Nev	5	26	21	26	s. 13 w.	22
Winnemucca, Nev	19	19	11	31	w.	20
Modena, Utah	3	25	4	47	s. 63 w.	48
Salt Lake City, Utah	21	22	26	15	s. 85 e.	11
Durango, Colo	37	7	10	26	n. 28 w.	34
Grand Junction, Colo	15	17	30	18	s. 81 e.	12
Northern Plateau.						
Baker City, Oreg	20	30	7	18	s. 48 w.	15
Boise, Idaho	23	15	13	29	n. 63 w.	18
Lewiston, Idaho†	6	6	24	1	e.	23
Pocatello, Idaho	5	33	22	24	s. 2 e.	28
Spokane, Wash	18	23	12	21	s. 61 w.	16
Walla Walla, Wash	10	33	8	21	s. 29 w.	26
North Pacific Coast Region.						
North Head, Wash	33	14	4	32	n. 56 w.	34
Port Crescent, Wash.*	12	1	1	23	n. 63 w.	25
Seattle, Wash	21	17	16	16	n.	4
Tacoma, Wash	27	16	1	28	n. 68 w.	29
Tatoosh Island, Wash	7	29	11	28	s. 38 w.	28
Portland, Oreg	29	16	6	23	n. 52 w.	22
Roseburg, Oreg	35	7	9	17	n. 16 w.	29
Middle Pacific Coast Region.						
Eureka, Cal	29	11	5	27	n. 51 w.	28
Mount Tamalpais, Cal	25	12	1	31	n. 67 w.	33
Red Bluff, Cal	12	28	20	15	s. 17 e.	17
Sacramento, Cal	2	50	15	6	s. 11 e.	49
San Francisco, Cal	1	19	1	53	s. 73 w.	56
San Jose, Cal.†	18	3	1	19	s. 50 w.	23
Southeast Farallon, Cal.*	11	10	0	18	n. 87 w.	18
South Pacific Coast Region.						
Fresno, Cal	26	8	3	41	n. 65 w.	42
Los Angeles, Cal	8	17	10	36	s. 71 w.	28
San Diego, Cal	18	13	6	36	n. 81 w.	30
San Luis Obispo, Cal	26	13	3	32	n. 66 w.	32
West Indies						
San Juan, Porto Rico	1	10	54	1	s. 80 e.	54

* From observations at 8 p. m. only. † From observations at 8 a. m. only.

TABLE IV.—*Accumulated amounts of precipitation for each 5 minutes, for storms in which the rate of fall equaled or exceeded 0.25 in any 5 minutes, or 0.80 in 1 hour, during August, 1907, at all stations furnished with self-registering gages.*

Stations.	Date.	Total duration. From—	Total duration. To—	Total amount of precipitation.	Excessive rate. Began—	Excessive rate. Ended—	Amount before excessive began.	5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
Abilene, Tex.	20			0.18						0.18											
Albany, N. Y.	27–28			0.18														0.13			
Alpena, Mich.	1–2			0.36														0.23			
Amarillo, Tex.	2	7:05 p. m.	11:43 p. m.	1.41	9:13 p. m.	9:55 p. m.	0.32	0.12	0.19	0.23	0.29	0.37	0.58	0.69	0.85						
Anniston, Ala.	15	3:15 p. m.	7:30 p. m.	1.12	3:19 p. m.	3:58 p. m.	0.01	0.20	0.39	0.54	0.56	0.67	0.87	0.95	1.04						
Asheville, N. C.	16	4:40 p. m.	5:25 p. m.	0.87	4:42 p. m.	4:53 p. m.	0.01	0.35	0.80	0.85											
Atlanta, Ga.	16			0.37					0.34												
Atlantic City, N. J.	9	12:40 p. m.	4:25 p. m.	1.20	12:57 p. m.	1:35 p. m.	0.03	0.12	0.22	0.29	0.39	0.52	0.63	0.74							
Augusta, Ga.	19			0.58							0.54										
Baker City, Oreg.	31			0.32														0.14			
Baltimore, Md.	9	8:15 a. m.	3:25 p. m.	1.37	8:34 a. m.	9:11 a. m.	0.02	0.08	0.20	0.50	0.74	0.95	1.10	1.18							
Bentonville, Ark.	21	4:10 a. m.	8:40 a. m.	1.48	4:20 a. m.	5:00 a. m.	0.01	0.05	0.16	0.22	0.38	0.62	0.73	0.80	0.88						
Binghamton, N. Y.	2			0.54						0.30											
Birmingham, Ala.	18	3:04 p. m.	3:50 p. m.	0.70	3:04 p. m.	3:27 p. m.	0.00	0.19	0.47	0.58	0.65	0.70									
Bismarck, N. Dak.	28			0.52														0.20			
Block Island, R. I.	24			0.67														0.16			
Boise, Idaho.	24			0.08									0.08								
Boston, Mass.	30–31			0.36														0.23			
Buffalo, N. Y.	20			0.23														0.20			
Burlington, Vt.	24			0.17														0.14			
Cairo, Ill.	12	9:45 a. m.	12:05 p. m.	0.79	10:04 a. m.	10:27 a. m.	0.07	0.07	0.14	0.22	0.38	0.45									
Canton, N. Y.	7			0.28									0.28								
Cape Henry, Va.	1			0.53														0.49			
Charles City, Iowa.	19	2:30 a. m.	9:55 a. m.	1.12	3:03 a. m.	3:36 a. m.	0.05	0.24	0.29	0.29	0.34	0.43	0.56	0.71							
Do	26	9:20 a. m.	11:55 a. m.	1.42	10:03 a. m.	10:41 a. m.	0.05	0.17	0.39	0.65	0.82	0.84	0.87	0.95	1.02						
Charleston, S. C.	8	1:56 p. m.	3:20 p. m.	1.27	1:59 p. m.	2:47 p. m.	0.01	0.15	0.31	0.53	0.71	0.80	0.93	1.07	1.13	1.19	1.21				
Do	16	1:02 p. m.	2:50 p. m.	1.00	1:35 p. m.	2:32 p. m.	0.01	0.08	0.28	0.43	0.53	0.62	0.68	0.74	0.77	0.81	0.98				
Charlotte, N. C.	9			0.52														0.40			
Chattanooga, Tenn.	20	1:55 p. m.	3:10 p. m.	1.24	2:05 p. m.	2:40 p. m.	0.02	0.11	0.31	0.53	0.70	0.99	1.16	1.21							
Cheyenne, Wyo.	29			0.29														0.23			
Chicago, Ill.	16	12:52 a. m.	3:52 a. m.	1.16	1:01 a. m.	1:56 a. m.	0.01	0.08	0.08	0.16	0.32	0.42	0.53	0.66	0.81	0.87	0.92	1.00			
Cincinnati, Ohio.	16			0.48														0.40			
Cleveland, Ohio.	1			0.53														0.40			
Columbia, Mo.	19–20	8:38 p. m.	D. N.	1.82	8:54 p. m.	9:14 p. m.	0.01	0.23	0.56	0.72	0.91										
Columbia, S. C.	22	8:30 p. m.	10:20 p. m.	1.49	8:39 p. m.	9:14 p. m.	0.01	0.33	0.66	0.86	0.89	1.05	1.25	1.34							
Columbus, Ohio.	20	3:30 p. m.	4:55 p. m.	0.88	3:50 p. m.	4:09 p. m.	0.01	0.16	0.49	0.72	0.82										
Concord, N. H.	21			0.55														0.19			
Corpus Christi, Tex.	31			0.56					0.39												
Davenport, Iowa.	26	9:25 p. m.	D. N.	1.94	10:13 p. m.	10:53 p. m.	0.01	0.20	0.64	1.08	1.19	1.22	1.31	1.69	1.85						
Del Rio, Tex.	†																				
Denver, Colo.	25			0.13														0.13			
Des Moines, Iowa.	29	1:35 a. m.	9:45 a. m.	2.35	1:41 a. m.	2:02 a. m.	0.01	0.33	0.63	0.72	0.78										
Detroit, Mich.	20			0.20									0.11								
Devils Lake, N. Dak.	8			0.31														0.31			
Dodge, Kans.	16	4:55 p. m.	5:27 p. m.	1.11	4:57 p. m.	5:25 p. m.	T.	0.46	0.65	0.79	0.99	1.09	1.11								
Do	16	6:35 p. m.	9:03 p. m.	1.10	7:05 p. m.	7:45 p. m.	0.04	0.11	0.16	0.31	0.55	0.68	0.75	0.77	0.87						
Dubuque, Iowa.	9	D. N.	D. N.	0.65	3:55 a. m.	4:20 a. m.	0.02	0.05	0.23	0.37	0.46	0.54									
Do	15	7:42 p. m.	10:25 p. m.	2.48	8:32 p. m.	9:42 p. m.	0.04	0.07	0.21	0.34	0.81	1.10	1.33	1.51	1.59	1.76	1.87	2.00	2.41		
Duluth, Minn.	18	2:25 p. m.	10:10 p. m.	2.50	4:48 p. m.	5:41 p. m.	0.28	0.28	0.52	0.71	0.78	0.89	1.00	1.03	1.04	1.05	1.12	1.20			
Durango, Colo.	2			0.79														0.36			
Eastport, Me.	11			0.25					0.24												
Elkins, W. Va.	2			0.33					0.32												
El Paso, Tex.	26			0.48							0.41										
Erie, Pa.	2			0.72						0.37											
Escanaba, Mich.	11	7:20 a. m.	12:40 p. m.	1.46	8:45 a. m.	9:27 a. m.	0.01	0.17	0.28	0.34	0.45	0.61	0.71	0.92	1.08	1.13					
Eureka, Cal.	8			2.61														0.33			
Evansville, Ind.	17	4:50 a. m.	11:15 a. m.	1.92	8:04 a. m.	8:54 a. m.	0.40	0.19	0.32	0.51	0.60	0.74	0.86	0.96	1.08	1.21	1.30				
Flagstaff, Ariz.	3	6:13 a. m.	10:10 a. m.	1.00	8:32 a. m.	9:02 a. m.	0.35	0.14	0.27	0.48	0.67	0.80	0.89								
Do	24	1:45 p. m.	3:35 p. m.	0.96	1:59 p. m.	2:35 p. m.	0.01	0.14	0.28	0.45	0.59	0.74	0.79	0.86	0.90						
Fort Smith, Ark.	4			0.29														0.19			
Fort Worth, Tex.	14			0.23									0.20								
Fresno, Cal.	†																				
Galveston, Tex.	13–14			0.54														0.39			
Grand Haven, Mich.	19	4:55 p. m.	8:55 p. m.	1.48	5:07 p. m.	5:52 p. m.	0.01	0.18	0.37	0.51	0.59	0.64	0.83	1.00	1.05	1.27					
Grand Junction, Colo.	25			0.69						0.19											
Grand Rapids, Mich.	19			0.80														0.55			
Green Bay, Wis.	15–16	10:15 p. m.	4:10 a. m.	2.90	11:55 p. m.	1:22 a. m.	0.53	0.05	0.13	0.23	0.35	0.59	0.74	0.98	1.14	1.27	1.38	1.70	2.28	2.39	
Hannibal, Mo.	16	2:40 a. m.	5:20 a. m.	1.24	3:35 a. m.	4:30 a. m.	0.13	0.19	0.35	0.48	0.67	0.67	0.76	0.81	0.89	0.97	1.03	1.10			
Do	19–20	6:42 p. m.	12:45 a. m.	1.43	6:52 p. m.	7:12 p. m.	0.01	0.26	0.47	0.68	0.86										
Harrisburg, Pa.	9	8:27 a. m.	10:10 a. m.	0.71	9:08 a. m.	9:30 a. m.	0.01	0.22	0.47	0.57	0.64										
Hartford, Conn.	24			0.64														0.13			
Hatteras, N. C.	3	11:30 a. m.	7:20 p. m.	3.51	11:34 a. m. 1:25 p. m.	12:52 a. m. 2:05 p. m.	0.01 2.35	0.15 0.11	0.61 0.18	0.87 0.29	1.10 0.46	1.12 0.53	1.15 0.59	1.15 0.66	1.23 0.76	1.36	1.56	1.85	2.32		
Havre, Mont.	14			0.14														0.12			
Helena, Mont.	27			0.38														0.16			
Honolulu, T. H.	15			0.36														0.20			
Houghton, Mich.	10–11	7:30 p. m.	6:00 a. m.	1.24	5:00 a. m.	5:25 a. m.	0.60	0.09	0.26	0.37	0.44	0.53									
Huron, S. Dak.	7			0.07														0.07			
Independence, Cal.	†																				
Indianapolis, Ind.	27			0.47						0.42											
Iola, Kans.	20			1.56														0.72			
Jacksonville, Fla.	4	1:05 p. m.	7:20 p. m.	2.96	1:45 p. m.	2:13 p. m.	0.14	0.44	1.10	1.56	1.83	1.98	2.05								
Do	9	12:51 p. m.	5:30 p. m.	1.71	2:00 p. m.	2:44 p. m.	0.23	0.14	0.26	0.31	0.41	0.55	0.75	1.04	1.23	1.33					
Jupiter, Fla.	9	1:45 p. m.	5:40 p. m.	1.09	1:45 p. m.	2:20 p. m.	0.00	0.27	0.55	0.65	0.75	0.88	0.99	1.04							
Do	10	4:10 p. m.	7:30 p. m.	0.97	4:19 p. m.	4:59 p. m.	0.01	0.10	0.25	0.34	0.52	0.61	0.64	0.68	0.83						
Kalispell, Mont.	2–3	8:25 p. m.	1:45 a. m.	0.78	9:07 p. m.	9:30 p. m.	T.	0.28	0.41	0.51	0.56	0.61									
Kansas City, Mo.	15	3:00 a. m.	D. N.	0.72	3:24 a. m.	3:59 a. m.	0.06	0.12	0.17	0.38	0.45	0.47	0.54	0.65							
Keokuk, Iowa	6–7	11:27 p. m.	1:00 a. m.	1.61	11:27 p. m.	12:02 a. m.	0.00	0.09	0.28	0.50	0.62	0.87	1.20	1.47							
Do	16	12:55 a. m.	2:05 a. m.	1.34	1:33 a. m.	2:03 a. m.	0.22	0.20	0.34	0.51	0.68	0.93	1.12								
Key West, Fla.	14			0.64					0.33												
Knoxville, Tenn.	17			0.40						0.36											
La Crosse, Wis.	19	2:22 a. m.	8:03 a. m.	1.97	7:13 a. m.	7:35 a. m.	1.48	0.05	0.27	0.36	0.44	0.46									
Lander, Wyo.	25			0.24														0.24			
La Salle, Ill.	29			0.79						0.47											
Lewiston, Idaho.	24			1.28														1.08			
Lincoln, Nebr.	4	7:35 p. m.	8:50 p. m.	1.18	8:09 p. m.	8:34 p. m.	0.01	0.25	0.53	0.68	0.90	1.12									
Do	7	8:00 p. m.	12:00 mdt.	2.02	8:41 p. m.	10:04 p. m.	0.01	0.17	0.26	0.38	0.45	0.53	0.55	0.56	0.65	0.80	1.05	1.37	1.78	1.89	
Little Rock, Ark.	17	6:42 p. m.	7:55 p. m.	0.98	6:53 p. m.	7:28 p. m.	0.01	0.08	0.24	0.40	0.62	0.76	0.83	0.91							
Los Angeles, Cal.	†																				
Louisville, Ky.	20			0.61							0.54										
Lynchburg, Va.	9			0.74														0.26			

TABLE IV.—*Accumulated amounts of precipitation for each 5 minutes, etc.*—Continued.

Stations.	Date.	Total duration. From—	Total duration. To—	Total amount of precipitation.	Excessive rate. Began—	Excessive rate. Ended—	Amount before excessive began.	5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
Macon, Ga	3			0.64							0.63										
Madison, Wis	19			1.12														0.66			
Marquette, Mich	11			0.48				0.27													
Memphis, Tenn	24			0.24														0.23			
Meridian, Miss	11	5:00 a. m.	6:30 a. m.	0.84	5:34 a. m.	6:06 a. m.	0.03	0.15	0.37	0.57	0.62	0.68	0.73	0.76							
Do	20	2:51 p. m.	4:05 p. m.	1.67	2:55 p. m.	3:41 p. m.	0.01	0.07	0.21	0.33	0.61	0.94	1.06	1.27	1.47	1.62	1.65				
Milwaukee, Wis	15–16	6:35 p. m.	3:10 a. m.	1.33	12:09 a. m.	12:34 a. m.	0.42	0.22	0.35	0.52	0.55	0.66									
Minneapolis, Minn	18	7:30 p. m.	D. N.	2.26	7:59 p. m.	8:41 p. m.	0.01	0.17	0.32	0.55	0.76	0.94	1.30	1.68	2.00	2.06					
Mobile, Ala	13	11:45 a. m.	2:20 p. m.	1.51	12:00 noon.	12:31 p. m.	0.08	0.13	0.40	0.66	0.85	1.10	1.20								
Do	24	5:10 p. m.	7:30 p. m.	1.20	5:15 p. m.	6:00 p. m.	0.01	0.22	0.45	0.54	0.61	0.76	0.83	0.88	0.94	1.01					
Montgomery, Ala	8			0.41														0.29			
Mount Tamalpais, Cal	8			0.02														0.01			
Mount Weather, Va	21			0.69														0.40			
Nantucket, Mass	24			0.57														0.19			
Nashville, Tenn	17			0.47					0.34												
New Haven, Conn	24			0.70														0.15			
New Orleans, La	5	2:02 p. m.	3:00 p. m.	1.22	2:03 p. m.	2:29 p. m.	T.	0.21	0.61	0.81	0.94	1.09	1.14								
New York, N. Y	24	8:59 p. m.	11:08 p. m.	0.97	10:00 p. m.	10:30 p. m.	0.24	0.05	0.12	0.21	0.37	0.50	0.66								
Norfolk, Va	10	2:17 p. m.	4:25 p. m.	1.35	2:20 p. m.	3:00 p. m.	0.01	0.09	0.25	0.47	0.65	0.77	0.96	1.06	1.15						
Northfield, Vt	4			0.39									0.33								
North Head, Wash	8			0 33														0.24			
North Platte, Nebr	27			0.39					0.33												
Oklahoma, Okla	22			0.58					0.35												
Omaha, Nebr	7–8	7:35 p. m.	12:25 a. m.	1.19	9:28 p. m.	10:07 p. m.	0.01	0.10	0.26	0.45	0.67	0.85	0.93	0.98	1.02						
Oswego, N. Y	24			0.20														0.20			
Palestine, Tex	21			0.13														0.06			
Parkersburg, W. Va	17	2:25 p. m.	4:40 p. m.	0.86	2:30 p. m.	2:55 p. m.	0.04	0.10	0.27	0.58	0.69	0.75									
Pensacola, Fla	4	11:15 a. m.	1:55 p. m.	1.53	11:28 a. m.	12:15 p. m.	0.01	0.32	0.55	0.71	0.81	0.85	0.95	1.11	1.26	1.35					
Peoria, Ill	6	1:22 p. m.	2:15 p. m.	0.93	1:32 p. m.	2:02 p. m.	0.04	0.09	0.23	0.40	0.54	0.69	0.87								
Do	27	D. N.	D. N.	0.99	12:44 a. m.	1:24 a. m.	0.01	0.31	0.45	0.61	0.58	0.63	0.66	0.80	0.91						
Philadelphia, Pa	21			0.72														0.41			
Phoenix, Ariz	18			0.48														0.37			
Pierre, S. Dak	14	5:15 p. m.	6:50 p. m.	1.11	6:29 p. m.	6:49 p. m.	0.04	0.13	0.31	0.81	1.03	1.07									
Pittsburg, Pa	24			0.45					0.44												
Pocatello, Idaho	3			0.85							0.55										
Point Reyes Light, Cal	9			0.05														0.03			
Port Huron, Mich	1			0.57														0.55			
Portland, Me	2			0.49						0.46											
Portland, Oreg	24			0.69														0.17			
Providence, R. I	4			0.33														0.10			
Pueblo, Colo	7	3:48 p. m.	5:06 p. m.	0.58	3:54 p. m.	4:20 p. m.	0.01	0.09	0.22	0.87	0.43	0.53									
Raleigh, N. C	3	5:43 p. m.	7:30 p. m.	1.07	5:43 p. m.	6:32 p. m.	0.00	0.15	0.40	0.58	0.63	0.68	0.69	0.70	0.86	0.91	0.99				
Red Bluff, Cal	†																				
Reno, Nev	31			0.23														0.14			
Richmond, Va	9			1.10														0.58			
Rochester, N. Y	3			0.24														0.23			
Roseburg, Oreg	7			0.37														0.15			
Roswell, N. M	21			0.47														0.21			
Sacramento, Cal	†																				
St. Louis, Mo	6–7	10:10 p. m.	7:10 a. m.	1.86	2:29 a. m.	3:15 a. m.	0.09	0.09	0.31	0.70	1.12	1.26	1.40	1.46	1.51	1.57					
St. Paul, Minn	18	7:40 p. m.	11:55 p. m.	1.82	8:19 p. m.	9:08 p. m.	0.02	0.20	0.33	0.44	0.68	0.82	1.01	1.26	1.44	1.55	1.63				
Salt Lake City, Utah	17			0.57														0.50			
San Antonio, Tex	31			0.40														0.38			
San Diego, Cal	†																				
Sand Key, Fla	1			0.29									0.29								
Sandusky, Ohio	1			0.65														0.33			
San Francisco, Cal	8			0.02														0.01			
San Jose, Cal	†																				
San Juan, Porto Rico	6			0.44					0.42												
San Luis Obispo, Cal	†																				
Sault Ste Marie, Mich	15			0.81														0.47			
Savannah, Ga	18	6:27 p. m.	D. N	1.90	6:31 p. m.	7:21 p. m.	0.01	0.28	0.42	0.59	0.73	0.94	1.07	1.19	1.38	1.51	1.56				
Scranton, Pa	24			0.61														0.49			
Seattle, Wash	1			0.24														0.22			
Shreveport, La	21			0.98														0.65			
Sioux City, Iowa	28			0.94														0.46			
Southeast Farallon, Cal	9			0.06														0.03			
Spokane, Wash	9			0.57														0.36			
Springfield, Ill	6	4:33 p. m.	5:55 p. m.	1.12	5:16 p. m.	5:45 p. m.	0.18	0.16	0.48	0.69	0.76	0.82	0.88								
Do	7	12:29 a. m.	D. N.	1.49	12:31 a. m	12:58 a. m.	0.02	0.26	0.61	0.91	1.10	1.18									
Springfield, Mo	24			0.37						0.37											
Tacoma, Wash	24			0.93														0.25			
Tampa, Fla	13	2:58 p. m.	6:17 p. m.	1.01	3:00 p. m.	3:40 p. m.	0.02	0.24	0.41	0.54	0.63	0.68	0.74	0.82	0.92						
Tatoosh Island, Wash	10			0.27														0.09			
Taylor, Tex	30			0.04														0.03			
Thomasville, Ga	8	6:45 p. m.	9:05 p. m.	1.43	6:47 p. m.	7:37 p. m.	0.01	0.11	0.13	0.13	0.14	0.15	0.20	0.61	0.94	1.21	1.35				
Toledo, Ohio	1			0.80														0.35			
Topeka, Kans	5	1:43 a. m.	2:10 a. m.	0.86	1:46 a. m.	2:02 a. m.	0.01	0.32	0.56	0.81											
Valentine, Nebr	25			0.66														0.43			
Vicksburg, Miss	11	5:55 p. m.	7:06 p. m.	1.33	6:06 p. m.	6:40 p. m.	0.01	0.23	0.63	1.01	1.16	1.20	1.24	1.30							
Washington, D. C	6			0.42							0.42										
Wichita, Kans	16	8:19 p. m.	11:03 p. m.	1.37	8:35 p. m.	9:08 p. m.	0.01	0.11	0.37	0.74	0.91	1.01	1.09	1.14							
Do	20	12:05 a. m.	7:40 a. m.	1.69	12:22 a. m.	12:50 a. m.	0.02	0.18	0.35	0.56	0.81	0.98	1.02								
Williston, N. Dak	3			0.58						0.56											
Wilmington, N. C	10	11:50 a. m.	6:45 p. m.	2.37	12:22 p. m.	1:12 p. m.	0.03	0.22	0.49	0.60	0.70	0.74	0.74	0.74	0.74	0.75	0.90				
					1:12 p. m.	2:07 p. m.		1.03	1.20	1.39	1.51	1.63	1.73	1.76	1.78	1.82	1.95	2.07			
Do	14	1:30 p. m.	2:50 p. m.	1.36	1:46 p. m.	2:16 p. m.	0.01	0.27	0.50	0.73	0.95	1.17	1.25								
Winnemucca, Nev	31			0.05														0.05			
Wytheville, Va	3			0.18														0.16			
Yankton, S. Dak	26			0.41						0.36											
Yellowstone Park, Wyo	25			0.18														0.16			

* Self-register not working. † No precipitation during the month.

52——6

TABLE V.—*Data furnished by the Canadian Meteorological Service, August, 1907.*

Stations.	Pressure, in inches. Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hours.	Departure from normal.	Temperature. Mean.	Departure from normal.	Mean maximum.	Mean minimum.	Precipitation. Total.	Departure from normal.	Total snowfall.
	Ins.	Ins.	Ins.	°	°	°	°	Ins.	Ins.	Ins.
St. Johns, N. F	29.79	29.92	-.04	57.0	- 2.8	64.4	49.6	4.80	+0.72	
Sydney, C. B. I	29.92	29.96	+.01	62.1	- 1.2	70.7	53.4	1.00	-2.62	
Halifax, N. S	29.86	29.96	.00	61.4	- 2.2	69.6	53.3	4.86	-0.51	
Grand Manan, N. B	29.86	29.91	-.04	60.6	- 0.9	68.2	53.1	2.78	-0.88	
Yarmouth, N. S	29.90	29.97	.00	58.2	- 2.0	65.4	50.9	4.76	+0.75	
Charlottetown, P. E. I	29.87	29.91	-.03	63.0	- 1.3	70.0	55.9	3.56	+0.18	
Chatham, N. B	29.86	29.88	-.05	63.8	+ 0.6	74.0	53.6	5.47	+1.43	
Father Point, Que	29.84	29.86	-.05	56.3	+ 0.7	63.2	49.4	4.10	+1.05	
Quebec, Que	29.60	29.92	-.01	61.5	- 1.6	69.9	53.1	3.22	-0.61	
Montreal, Que	29.74	29.94	-.01	64.8	- 1.6	72.8	56.7	1.23	-2.34	
Rockliffe, Ont	29.36	29.96	.00	60.5	- 2.7	72.9	48.0	1.15	-1.80	
Ottawa, Ont	29.70	30.02	+.06	64.4	- 0.4	73.8	55.1	0.70	-2.33	
Kingston, Ont	29.70	30.01	+.03	64.8	- 2.2	73.0	56.5	0.63	-1.75	
Toronto, Ont	29.63	29.99	.00	65.3	- 0.7	76.2	54.4	1.09	-1.67	
White River, Ont	......	......	......	......	......	......	......	......	......	
Port Stanley, Ont	28.39	30.03	+.03	63.9	- 2.0	73.9	53.9	1.12	-1.30	
Saugeen, Ont	29.32	30.02	+.03	62.8	- 1.0	72.8	52.8	0.49	-1.76	
Parry Sound, Ont	29.25	29.93	-.05	63.6	+ 0.1	76.1	51.1	4.04	+1.32	
Port Arthur, Ont	29.22	29.93	-.03	58.8	- 0.7	68.2	49.4	5.06	+2.31	
Winnipeg, Man	29.04	29.86	-.08	61.5	- 1.9	71.9	51.1	3.90	+1.23	
Minnedosa, Man	28.06	29.87	-.07	59.1	- 0.3	69.9	48.3	3.27	+1.17	
Regina, Sask	27.88	......	......	59.8	......	73.4	46.3	4.34	......	
Medicine Hat, Alberta	27.59	29.84	-.08	63.9	- 1.8	78.2	49.6	0.62	-1.05	
Swift Current, Sask	27.35	29.87	-.06	61.6	- 2.4	76.1	47.0	3.59	+1.68	
Calgary, Alberta	26.39	29.89	-.02	55.0	- 4.4	66.8	43.1	3.34	+1.20	
Banff, Alberta	25.39	29.93	+.02	51.8	- 4.5	62.7	41.0	4.26	+1.73	
Edmonton, Alberta	27.58	29.85	-.07	55.9	- 2.9	67.3	44.5	4.66	+2.53	
Prince Albert, Sask	......	......	......	......	......	......	......	......	......	
Battleford, Sask	28.13	29.84	-.07	59.0	- 3.6	71.7	46.2	2.58	+0.22	
Kamloops, B. C	28.74	29.94	+.03	64.9	- 3.7	77.1	52.7	1.73	+0.64	
Victoria, B. C	29.94	30.03	+.02	60.4	+ 1.7	69.7	51.0	0.23	-0.37	
Barkerville, B. C	25.70	30.00	+.10	48.9	- 7.4	58.6	39.3	5.24	+2.14	
Hamilton, Bermuda	30.00	30.16	+.06	79.4	- 0.2	84.4	74.4	3.16	-2.92	
Dawson, Yukon	......	......	......	......	......	......	......	......	......	

TABLE VI.—*Heights of rivers referred to zeros of gages, August, 1907.*

Stations.	Distance to mouth of river.	Flood stage on gage.	Highest water. Height.	Highest water. Date.	Lowest water. Height.	Lowest water. Date.	Mean stage.	Monthly range.
	Miles.	Feet.	Feet.		Feet.		Feet.	Feet.
Yellowstone River.								
Billings, Mont	330	8	5.9	1	3.0	24, 25	4.1	2.9
James River.								
Huron, S. Dak	139	9	0.6	1,4	- 0.1	31	0.2	0.7
Republican River.								
Clay Center, Kans	42	18	6.6	1	4.9	30,31	5.4	1.7
Smoky Hill-Kansas River.								
Abilene, Kans	254	22	4.9	1	0.7	12, 13	1.5	4.2
Manhattan, Kans	160	18	5.3	1	3.0	29-31	3.5	2.3
Topeka, Kans	87	21	8.0	2,3	5.7	29-31	6.7	2.3
Missouri River.								
Townsend, Mont	2,504	11	6.0	1,2	4.4	23-27	5.0	1.6
Fort Benton, Mont	2,285	12	4.1	1	1.6	23, 25-31	2.6	2.5
Wolfpoint, Mont	1,952	17	3.7	3	- 0.3	31	1.6	4.0
Bismarck, N. Dak	1,309	14	7.5	1	3.7	30, 31	5.6	3.8
Pierre, S. Dak	1,114	14	7.1	1	3.6	31	5.1	3.5
Sioux City, Iowa	784	17	10.9	1	7.6	31	9.0	3.3
Blair, Nebr	705	15	11.2	1,2	8.2	28-31	9.5	3.0
Omaha, Nebr	669	18	14.9	1	10.4	29	12.4	4.5
St. Joseph, Mo	481	10	9.2	1	3.8	31	6.5	5.4
Kansas City, Mo	388	21	18.1	1	10.6	31	14.4	7.5
Glasgow, Mo	231	18	15.1	1	8.0	31	11.8	7.1
Boonville, Mo	199	20	16.8	1	10.3	31	13.7	6.5
Hermann, Mo	103	24	15.8	1	9.2	31	12.5	6.6
Minnesota River.								
Mankato, Minn	127	18	5.7	1	3.0	18, 19	4.1	2.7
St. Croix River.								
Stillwater, Minn	23	11	6.0	1	3.9	21	4.8	2.1
Illinois River.								
La Salle, Ill	197	18	17.1	22	15.3	29, 30	15.9	1.8
Peoria, Ill	135	14	13.6	1	12.2	16	12.8	1.4
Beardstown, Ill	70	12	14.5	22	12.8	6-8	13.6	1.7
Conemaugh River.								
Johnstown, Pa	64	7	6.5	24	0.8	21-23	1.9	5.7
Allegheny River.								
Warren, Pa	177	14	0.1	1-3	- 0.5	31	-0.2	0.6
Parker, Pa	73	20	1.8	3	0.1	24, 29, 31	0.6	1.7
Freeport, Pa	29	20	3.7	25	0.7	22-24	1.8	3.0
Youghiogheny River.								
Confluence, Pa	59	10	2.1	25	0.5	16, 17, 20	0.9	1.6
West Newton, Pa	15	23	4.7	24	0.2	23	1.2	4.5
Monongahela River.								
Fairmont, W. Va	119	25	19.8	25	14.5	18	15.5	5.3
Greensboro, Pa	81	18	14.3	25	7.1	22	8.3	7.2
Lock No. 4, Pa	40	28	15.5	25	6.4	21, 23	8.2	9.1
Muskingum River.								
Zanesville, Ohio	70	25	10.6	1	8.0	31	8.5	2.6
Little Kanawha River.								
Creston, W. Va	38	20	17.0	24	2.0	16	4.4	15.0
New-Great Kanawha River.								
Hinton, W. Va	153	14	2.8	26	1.2	19	1.7	1.6
Charleston, W. Va	58	30	13.4	25	4.0	31	7.1	9.4
Scioto River.								
Columbus, Ohio	110	17	3.3	2	1.6	31	2.3	1.7
Licking River.								
Falmouth, Ky	30	25	13.0	23	0.8	21	2.4	12.2
Kentucky River.								
Beattyville, Ky	254	30	2.8	22, 24	0.2	13-16	0.9	2.6
Frankfort, Ky	65	31	7.1	26	5.4	12	6.0	1.7
Wabash River.								
Mount Carmel, Ill	75	15	5.4	10	3.2	31	4.0	2.2
Cumberland River.								
Burnside, Ky	518	50	2.5	25	- 0.1	19	1.1	2.6
Celina, Tenn	383	45	3.3	28	1.2	22	2.1	2.1
Carthage, Tenn	308	40	2.3	6, 29	1.0	23	1.7	1.3
Nashville, Tenn	193	40	8.4	11	7.3	24, 25	7.7	1.1
Clarksville, Tenn	126	43	5.8	10	2.1	27	3.4	3.7
Clinch River.								
Speers Ferry, Va	156	20	2.2	19	0.0	31	0.8	2.2
Clinton, Tenn	52	25	7.3	21	4.0	15, 31	5.3	3.3
South Fork Holston River.								
Bluff City, Tenn	35	12	2.5	10	1.0	31	1.5	1.5
Holston River.								
Rogersville, Tenn	103	14	3.3	19	1.9	13	2.4	1.4
French Broad River.								
Asheville, N. C	144	4	0.1	23	- 0.6	5-7, 10, 29-31	-0.4	0.7
Dandridge, Tenn	46	12	1.9	25	0.8	5-7, 16, 30, 31	1.1	1.1
Tennessee River.								
Knoxville, Tenn	635	12	3.0	11	1.2	7	1.8	1.8
Loudon, Tenn	590	25	3.2	26	1.6	9, 30, 31	2.0	1.6
Kingston, Tenn	556	25	2.9	1	1.8	8, 9	2.3	1.1
Chattanooga, Tenn	452	33	5.8	1, 2	2.9	10	3.8	2.9
Bridgeport, Ala	402	24	4.0	2	1.5	8	2.2	2.5
Guntersville, Ala	349	31	6.2	3	3.1	9, 12, 13	4.1	3.1
Florence, Ala	255	16	2.8	4	1.2	9	1.7	1.6
Riverton, Ala	225	26	5.0	5	3.0	10	3.8	2.0
Johnsonville, Tenn	95	21	4.5	6	3.0	3, 11	3.5	1.5
Ohio River.								
Pittsburg, Pa	966	22	7.6	25	2.1	29	5.6	5.5
Dam No. 2, Pa	956	25	8.1	26	0.7	23	2.7	7.4
Beaver Dam, Pa	925	27	11.9	26	3.0	23	5.2	8.9
Wheeling, W. Va	875	36	10.0	27	2.5	24	4.9	7.5
Parkersburg, W. Va	785	36	9.9	28	3.8	22, 23	6.6	6.1
Point Pleasant, W. Va	703	39	14.3	25	3.8	22, 23	6.9	10.5
Huntington, W. Va	660	50	19.3	26	7.0	22	11.0	12.3
Catlettsburg, Ky	651	50	19.5	26	6.4	16, 22	10.4	13.1
Portsmouth, Ohio	612	50	19.7	26	7.5	17	11.5	12.2
Maysville, Ky	559	50	19.0	27	8.0	17, 18	11.7	11.0
Cincinnati, Ohio	499	50	21.9	1	9.5	9	13.5	12.4
Madison, Ind	413	46	18.6	1	8.3	20	11.7	10.3
Louisville, Ky	367	28	8.4	1	4.0	20	5.7	4.4
Evansville, Ind	184	35	16.0	3, 4	7.1	23	10.3	8.9
Mount Vernon, Ind	148	35	15.2	4	6.3	23	9.8	8.9
Paducah, Ky	47	40	16.9	1	7.8	17	10.5	9.1
Cairo, Ill	1	45	30.7	1	19.5	31	22.9	11.2
Neosho River.								
Iola, Kans	262	10	1.0	23	- 0.3	11, 14	0.0	1.3
Oswego, Kans	184	20	1.6	24	0.2	2-22	0.5	1.4
Fort Gibson, Ind. T	3	22	10.5	29, 30	8.5	20-22	9.1	2.0
Canadian River.								
Calvin, Ind. T	99	10	5.8	27	1.9	26	3.1	3.9
Black River.								
Blackrock, Ark	67	12	6.1	22	3.2	16, 17, 19, 20	3.7	2.9
White River.								
Calicorock, Ark	272	18	1.0	2, 3	- 0.1	17-22	0.3	1.1
Batesville, Ark	217	18	2.9	1, 3, 4	1.9	17-19	2.3	1.0
Clarendon, Ark	75	30	11.6	1	9.2	20, 21	10.4	2.4
Arkansas River.								
Wichita, Kans	832	10	2.5	1	- 0.8	31	0.5	3.3
Tulsa, Ind. T	551	16	6.7	1	3.2	19-21	4.3	3.5
Webbers Falls, Ind. T	465	23	7.6	3	4.0	19, 20	5.5	3.6
Fort Smith, Ark	403	22	6.9	29	2.7	22	4.2	4.2
Dardanelle, Ark	256	21	6.0	31	2.3	22, 25, 26	3.6	3.7
Little Rock, Ark	176	23	6.5	7, 8	3.8	21-24, 27	4.6	2.7
Pine Bluff, Ark	121	25	9.2	9	6.5	24-26	7.3	2.7
Yazoo River.								
Greenwood, Miss	175	38	5.3	5, 6	2.7	18-20	3.6	2.6
Yazoo City, Miss	80	25	5.3	6, 7	- 0.1	23, 24	2.4	5.4
Ouachita River.								
Camden, Ark	304	39	5.8	27, 28	3.7	21	4.6	2.1
Monroe, La	122	40	7.0	1	2.4	24	4.1	4.6
Red River								
Arthur City, Tex	688	27	10.6	5	6.2	30	7.9	4.4

Table VI.—*Heights of rivers referred to zeros of gages*—Continued.

Stations.	Distance to mouth of river.	Flood stage on gage.	Highest water. Height.	Highest water. Date.	Lowest water. Height.	Lowest water. Date.	Mean stage.	Monthly range.
Red River—Cont'd.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Fulton, Ark	515	28	10.8	8	7.8	31	9.1	3.0
Shreveport, La.	327	29	4.2	1	0.4	31	2.1	3.8
Alexandria, La.	118	33	......	......	3.8	31	......	......
Mississippi River.								
Fort Ripley, Minn.	2,082	10	6.7	20	4.9	5	5.6	1.8
St. Paul, Minn.	1,954	14	5.7	1	4.2	16	4.9	1.5
Red Wing, Minn.	1,914	14	3.9	1	2.5	17	3.2	1.4
Reeds Landing, Minn	1,884	12	4.0	1	2.5	18, 20, 21	3.3	1.5
La Crosse, Wis.	1,819	12	5.8	23	3.7	18	4.3	2.1
Prairie du Chien, Wis.	1,759	18	6.4	1	3.9	19	5.1	2.5
Dubuque, Iowa	1,699	15	7.1	1	4.4	19	5.7	2.7
Leclaire, Iowa	1,609	10	5.1	1	2.6	15	3.9	2.5
Davenport, Iowa	1,593	15	6.8	1	4.1	15	5.4	2.7
Muscatine, Iowa	1,562	16	8.6	1	5.4	15, 16	6.6	3.2
Galland, Iowa	1,472	8	4.9	1	2.7	16	3.6	2.2
Keokuk, Iowa	1,463	15	9.1	1	4.9	15	6.5	4.2
Warsaw, Ill.	1,458	18	12.1	1	8.0	15	9.4	4.1
Hannibal, Mo	1,402	13	10.8	1	6.2	16	7.8	4.6
Grafton, Ill	1,306	23	16.9	1	10.3	29, 30	12.3	6.6
St. Louis, Mo	1,264	30	25.8	1	14.1	31	18.6	11.7
Chester, Ill	1,189	30	22.5	1	12.1	31	16.1	10.4
New Madrid, Mo.	1,003	34	25.9	1	16.2	31	19.2	9.7
Luxora, Ark	905	33	19.8	1, 2	9.4	29–31	12.8	10.4
Memphis, Tenn	843	33	25.1	1	14.0	22	17.8	11.1
Helena, Ark.	767	42	32.3	1, 2	18.6	22	23.7	13.7
Arkansas City, Ark.	635	42	34.5	3	21.1	24	26.9	13.4
Greenville, Miss.	595	42	25.5	3, 4	17.2	24	22.3	8.3
Vicksburg, Miss.	474	45	31.7	5, 6	18.8	27	25.4	12.9
Natchez, Miss.	373	46	32.0	6–8	19.9	29, 30	26.6	12.1
Baton Rouge, La.	240	35	22.3	7–9	11.8	29–31	18.2	10.5
Donaldsonville, La	188	28	16.9	8, 9	8.2	30, 31	13.7	8.7
New Orleans, La.	108	16	11.0	2, 9, 10	5.9	31	9.1	5.1
Atchafalaya River.								
Simmesport, La.	127	33	26.1	1	14.3	31	21.4	11.8
Melville, La.	103	31	28.1	1	18.0	30, 31	24.2	10.1
Mohawk River.								
Schenectady, N. Y.	19	15	1.2	24, 25, 30	0.5	3–6, 11–15	0.9	0.7
Hudson River.								
Albany, N. Y.	147	12	4.4	12, 13	0.9	19	2.8	3.5
Delaware River.								
Hancock (E. Branch), N. Y.*	287	12	2.5	8	2.2	22, 23, 30, 31	2.3	0.3
Hancock (W. Branch), N. Y.	287	10	3.0	5	2.2	30, 31	2.5	0.8
Port Jervis, N. Y.	215	14	0.8	30, 31	− 0.4	4–7	0.4	1.2
Phillipsburg, N. J.	146	26	0.3	1, 2, 5, 6, 25, 26	0.0	15–20, 22–24, 28–31	0.1	0.3
Trenton, N. J.	92	18	0.8	1–4	0.4	22–24	0.6	0.4
North Branch Susquehanna.								
Binghamton, N. Y.	183	16	2.1	1–3, 5–8	1.6	19	1.9	0.5
Towanda, Pa	139	16	1.0	1, 2	0.2	22–31	0.4	0.8
Wilkes-Barre, Pa.	60	17	3.2	1	2.2	23, 29–31	2.6	1.0
West Branch Susquehanna.								
Renovo, Pa.	90	16	0.9	12	− 0.2	25	0.2	1.1
Williamsport, Pa.	39	20	1.0	13	0.4	18, 19, 21–23, 26–31	0.6	0.6
Susquehanna River.								
Harrisburg, Pa.	69	17	1.5	1	0.6	20–23, 31	1.0	0.9
Shenandoah River.								
Riverton, Va.	58	22	− 0.3	26	− 1.2	20–24	−1.0	0.9
Potomac River.								
Cumberland Md	290	8	3.5	25	1.9	22, 23	2.4	1.6
Harpers Ferry, W. Va.	172	18	2.0	12	− 0.2	20–23	0.8	2.2
James River.								
Buchanan, Va.	305	12	3.2	26	2.2	17–23	2.3	1.0
Lynchburg, Va.	260	18	2.0	26–28	0.8	8, 9	1.4	1.2
Columbia, Va.	167	18	5.0	11	2.7	6	3.2	2.3
Richmond, Va.	111	12	1.0	12	− 1.0	4	0.3	2.0
Roanoke River.								
Clarksville, Va	196	12	1.5	11	− 0.3	31	0.2	1.8
Weldon, N. C.	129	30	11.7	13	9.4	30, 31	10.2	2.3
Tar River.								
Greenville, N. C.	21	22	8.2	26	4.0	31	5.9	4.2
Cape Fear River.								
Fayetteville, N. C	112	38	11.2	24	2.3	31	5.0	8.9
Pedee River.								
Cheraw, S C	149	27	4.2	6	1.7	30, 31	2.5	2.5
Smiths Mills, S. C.	51	16	8.4	25	4.8	19	6.2	3.6
Lynch Creek.								
Effingham, S. C.	35	12	7.4	26	4.3	14	6.0	3.1
Black River.								
Kingstree, S. C.	45	12	9.0	30, 31	3.0	2	6.2	6.0
Catawba-Wateree River.								
Mount Holly, N. C.	143	15	2.1	10	1.8	1–9, 29–31	1.9	0.3
Catawba, S. C	107	11	4.8	24	1.7	8, 9, 16, 17	2.1	3.1
Camden, S. C.	37	14	14.0	25	4.8	9	6.7	9.2
Congaree River.								
Columbia, S. C	52	15	2.9	16, 24	0.7	30	1.7	2.2
Santee River.								
St. Stephens, S. C.	50	10	8.1	23	3.4	10	6.6	4.7
Savannah River.								
Augusta, Ga.	268	32	12.9	17	5.9	31	8.0	7.0
Oconee River.								
Dublin, Ga	79	30	5.5	2	− 0.8	31	1.3	6.3
Ocmulgee River.								
Macon, Ga.	203	18	5.1	13	0.7	31	2.4	4.4
Flint River.								
Montezuma, Ga.	152	20	9.2	15	2.4	31	5.0	6.8
Albany, Ga.	90	20	8.8	16	1.4	30, 31	5.4	7.4
Bainbridge, Ga.	29	22	10.2	17	4.0	31	7.1	6.2
Chattahoochee River.								
West Point, Ga	239	20	4.0	17	1.7	30, 31	2.4	2.3
Eufaula, Ala	90	40	6.4	5	1.0	31	3.7	5.4
Alaga, Ala.	30	25	8.1	14	2.6	31	5.2	5.5
Coosa River.								
Rome, Ga.	266	30	3.5	17	1.0	5, 6	1.8	2.5
Gadsden, Ala.	162	22	3.3	18	1.1	9	1.9	2.2
Lock No. 4, Ala.	113	17	2.6	11	0.9	7, 8, 31	1.6	1.7
Wetumpka, Ala	12	45	7.3	1	3.1	31	4.7	4.2
Alabama River.								
Montgomery, Ala.	323	35	5.4	1	2.0	28, 30, 31	3.0	3.4
Selma, Ala	246	35	7.2	1	1.7	30, 31	3.5	5.5
Black Warrior River.								
Tuscaloosa, Ala.	90	43	6.0	20	4.8	27–31	5.3	1.2
Tombigbee River.								
Columbus, Miss	316	33	− 1.8	1	− 2.9	19–24	−2.7	1.1
Demopolis, Ala.	168	35	1.9	1	− 1.0	31	0.1	2.9
Pascagoula River.								
Merrill, Miss.	78	20	15.6	2	3.5	31	7.2	12.1
Pearl River.								
Columbia, Miss.	110	14	8.0	3	3.9	21	5.0	4.1
Sabine River.								
Logansport, La.	315	25	2.2	1	0.8	22–24	1.3	1.4
Neches River.								
Beaumont, Tex.	18	10	1.4	23	0.2	1	1.0	1.2
Trinity River.								
Dallas, Tex.	320	25	6.4	6	3.0	19–23	3.9	3.4
Liberty, Tex	20	25	12.0	1	4.0	31	5.2	8.0
Brazos River.								
Waco, Tex.	285	22	4.8	11	3.1	31	3.7	1.7
Valley Junction, Tex.	215	40	1.0	1–5	0.9	6–31	0.9	0.1
Hempstead, Tex	140	40	2.0	3	− 2.0	22	−0.3	4.0
Booth, Tex	61	39	4.9	2	3.0	25	4.1	1.9
Colorado River.								
Austin, Tex.	214	18	2.1	7	0.6	30, 31	1.1	1.5
Columbus, Tex.	98	24	8.0	1, 12	6.0	29–31	6.9	2.0
Rio Grande.								
San Marcial, N. Mex.	1233	11	13.5	31	8.0	17, 18	8.8	5.5
El Paso, Tex.	1030	14	11.5	30, 31	8.5	20	9.7	3.0
Colorado River.								
Yuma, Ariz.	85	......	23.3	4	19.7	31	21.3	3.6
Red River of the North.								
Moorhead, Minn.	284	26	9.1	1	8.0	28–31	8.6	1.1
Snake River.								
Lewiston, Idaho	144	24	5.9	1	1.7	28, 29	3.2	4.2
Columbia River.								
Wenatchee, Wash	473	40	25.0	1	17.0	31	19.7	8.0
Umatilla, Oreg	270	25	12.5	1	7.6	28–31	9.7	4.9
The Dalles, Oreg.	166	40	19.4	1	10.8	28, 31	14.4	8.6
Willamette River.								
Albany, Oreg.	118	20	1.6	9	0.8	21–26	1.0	0.8
Portland, Oreg.	12	15	16.3	1	4.6	31	7.6	5.7
Sacramento River.								
Red Bluff, Cal.	265	23	1.5	1–4	1.2	25–31	1.3	0.3
Sacramento, Cal.	64	25	11.8	1	8.4	31	9.8	3.4

* 7 days missing.

Honolulu, T. H., latitude 21° 19′ north, longitude 157° 30′ west; barometer above sea, 38 feet; gravity correction, —0.057 inch, applied. August, 1907.

Day.	Pressure.*		Air temperature.				Moisture.				Wind.				Precipitation.		Clouds.					
							8 a. m.		8 p. m.		8 a. m.		8 p. m.				8 a. m.			8 p. m.		
	8 a. m.	8 p. m.	8 a. m.	8 p. m.	Maximum.	Minimum.	Wet.	Relative humidity.	Wet.	Relative humidity.	Direction.	Velocity.	Direction.	Velocity.	8 a. m.	8 p. m.	Amount.	Kind.	Direction.	Amount.	Kind.	Direction.
1	30.08	30.05	79.2	77.0	83	72	69.2	60	70.0	71	ne.	13	ne.	6	0.00	0.00	7 2	Ci.-cu. Cu.	0 e.	7	S.	ne.
2	30.03	29.97	76.0	74.0	81	71	67.5	64	70.0	82	ne.	13	ne.	9	0.13	T.	5	S.-cu.	e.	8	N.	ne.
3	30.00	29.99	77.8	76.5	82	72	69.0	64	70.0	72	ne.	10	ne.	7	0.05	0.03	3	Cu.	e.	3	Cu.	e.
4	30.02	29.99	78.5	77.0	82	74	70.0	66	70.0	71	ne.	11	ne.	12	0.01	0.00	1	Cu.	se.	3	S.	e.
5	30.02	29.97	76.0	77.0	82	74	69.0	70	68.5	65	ne.	13	ne.	8	0.00	0.00	7 1	A.-cu. Cu.	sw. 0	5	S.	ne.
6	29.95	29.93	77.4	75.5	82	74	69.0	65	69.0	72	ne.	5	ne.	9	0.00	0.04	9	Cu.	e.	4	S.	ne.
7	29.97	29.98	77.7	76.0	81	69	69.0	64	69.0	70	ne.	11	e.	9	0.07	0.17	2	Cu.	e.	3	S.	e.
8	30.00	29.99	77.0	76.0	81	70	70.2	71	70.0	74	ne.	11	ne.	9	0.08	0.01	7	S.-cu.	e.	2	S.	ne.
9	30.01	29.96	78.5	78.0	81	72	71.5	71	73.0	79	e.	14	e.	13	0.10	0.11	7	Cu.	e.	10	N.	e.
10	30.01	30.03	79.5	79.0	84	73	73.0	74	71.5	69	e.	22	e.	10	0.06	0.00	4	Cu.	e.	0	0	0
11	30.04	29.99	79.5	77.7	83	75	70.5	62	70.2	69	e.	8	ne.	12	T.	0.00	2	Cu.	e.	3	S.	ne.
12	29.99	29.96	79.2	77.0	84	74	70.5	65	70.0	71	e.	10	e.	7	T.	0.00	6 2	A.-s. Cu.	sw. e.	1	Cu.	e.
13	29.97	29.98	79.0	77.5	83	75	69.5	62	70.0	69	ne.	10	ne.	5	0.00	0.00	1 1	Ci.-s. Cu.	0 e.	10	Cu.	ne.
14	30.00	29.98	77.0	78.0	82	74	71.5	77	71.0	71	ne.	7	ne.	9	T.	T.	2 7	A.-s. N.	0 e.	1 7	S.-cu. Cu.	e. e.
15	30.01	29.96	72.5	76.0	80	71	72.0	98	71.2	79	se.	2	e.	12	0.13	0.23	10 Lt.	N. Fog.	e. 0	1 4	A.-s. Cu.	sw. ne.
16	29.97	29.98	77.0	76.5	80	75	71.5	77	70.0	72	e.	5	s.	3	0.00	0.07	9	S.-cu.	e.	4 5	S.-cu. Cu.	ne. ne.
17	29.94	29.91	79.2	76.5	82	74	72.0	70	71.0	76	n.	2	n.	4	0.63	T.	9 1	A.-s. Cu.	sw. 0	7	S.-cu.	nw.
18	29.96	29.98	77.0	77.0	83	72	73.0	83	73.0	83	e.	2	ne.	2	0.16	T.	2 8	A.-s. S.-cu.	0 e.	10	S.-cu.	ne.
19	29.96	29.95	80.0	78.5	84	75	72.0	68	72.5	75	n.	2	ne.	7	0.00	0.00	9	S.-cu.	sw.	9	S.-cu.	n.
20	29.96	29.97	80.5	79.0	85	77	73.0	70	72.0	71	e.	6	e.	12	0.00	0.00	6	Cu.	e.	9	Cu.	se.
21	29.96	29.93	80.2	77.0	83	74	70.3	61	70.0	71	ne.	8	ne.	5	0.00	0.00	3	Cu.	e.	4	Cu.	ne.
22	29.93	29.94	79.2	77.0	83	74	70.2	64	70.0	71	ne.	7	e.	12	T.	T.	1	Cu.	e.	9	Cu.	e.
23	29.96	29.99	80.0	77.0	84	75	70.3	62	71.0	74	se.	6	ne.	4	0.00	0.00	5	Ci.-s.	0	1	Cu.	ne.
24	30.03	30.03	79.3	76.0	84	74	69.2	60	71.0	78	ne.	8	ne.	7	0.00	T.	2 1	Cu. Cu.-n.	e. e.	6	N.	e.
25	30.04	29.98	77.2	77.0	83	75	70.2	71	72.5	81	ne.	8	ne.	12	0.01	T.	6	Cu.	e.	1 1	Cu. Cu.-n.	ne. ne.
26	29.98	29.93	79.0	77.0	84	74	69.0	60	72.5	81	ne.	9	e.	12	T.	T.	4	Cu.	e.	7	S.	e.
27	29.98	29.98	78.0	77.0	82	75	72.5	77	71.0	74	ne.	9	ne.	9	0.01	T.	7	Cu.	e.	4	S.	ne.
28	29.98	29.94	77.5	76.5	82	73	69.5	67	69.0	68	ne.	9	e.	10	0.02	T.	7	S.-cu.	e.	1 5	Cu. S.	e. e.
29	29.94	29.90	76.0	76.0	83	74	67.4	64	68.0	66	ne.	7	ne.	3	T.	T.	2 1	Cu. N.	e. e.	Light haze.		....
30	29.93	29.92	78.2	76.5	84	72	69.0	63	69.0	68	e.	9	e.	3	0.00	0.00	1	Cu.	e.	0	0	0
31	29.95	29.92	80.0	77.5	84	72	71.0	64	70.0	69	e.	4	ne.	3	0.00	0.00	3	Cu.	e.	10	S.	ne.
Mean	29.986	29.965	78.2	76.9	82.6	73.4	70.4	68.2	70.5	73.0	ne.	8.4	ne.	7.9	0.86	0.66	5.6	Cu.	e.	5.3	Cu. & S.	ne.

Observations are made at 8 a.m. and 8 p.m., local standard time, which is that of 157° 30′ west, and is 5h and 30m slower than 75th meridian time. *Pressure values are reduced to sea level and standard gravity.

EARTHQUAKES AND RAINFALL IN JAMAICA.

Thru the kindness of Mr. Maxwell Hall, meteorologist to the government of Jamaica and now in charge of the meteorological service of that island, we have received the following data:

Register of earthquakes.—The report on the earthquake of January 14, 1907, No. 337 of this series, p. 18, carried us up to July 5. Since then we have had the following shocks: July 23, 8:11 a. m., No. I Kingston; July 28, 4:30 a. m., No. I Kingston; August 8, 5:30 p. m., No. I Unity Valley; August 22, 4:25 p. m., No. II Kingston, N. 85° E. 0.012 in. 3 seconds; August 28, 10:30 p. m., No. I Kempshot Observatory.

It thus appears that the cessation of the after-shocks has been well marked; they apparently stopt at the end of July. With reference to the shock of August 22, it was not felt at Chapelton, as far as I am aware; but the seismometer there was examined and was found to have recorded a No. II shock N. 3° E.: 0.010 inch. This does not combine well with the Kingston record and other circumstances. They may both have been shocks felt locally only, and at different dates, a rather poor beginning of the new series.

The rainfall for August was below the average thruout the island. The maximum rainfall recorded was at Morgans Bridge, in the west-central division, 17.24 inches. No rain fell at Falmouth and Braco, in the northern division, and a dozen other stations in the same division recorded under half an inch for the month.

Comparative table of rainfall.

[Based upon the average stations only.]

AUGUST, 1907.

Divisions.	Relative area.	Number of stations.	Rainfall.	
			1907.	Average.
	Per cent.		*Inches.*	*Inches.*
Northeastern division	25	17	3.65	7.71
Northern division	22	41	2.15	4.33
West-central division	26	20	7.96	9.73
Southern division	27	26	4.75	5.83
Means	....	....	4.63	6.90

The drought in Jamaica (taken from the Weather Reports).

Month.	NE.	N.	W.C.	S.	The island.	Average for island.
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*	*Inches.*
1906. November	12.97	5.59	6.77	5.05	7.60	6.50
December	5.37	2.12	0.36	0.42	2.04	5.53
1907. January	5.41	2.70	1.47	0.73	2.58	3.79
February	4.71	3.18	3.89	3.21	3.75	2.62
March	0.76	0.07	0.21	0.40	0.36	2.86
April	0.86	0.62	2.43	1.07	1.24	4.20
May	4.78	4.23	5.42	6.05	5.12	9.56
June	6.74	3.60	8.55	4.93	5.96	6.11
July	5.89	2.34	5.73	3.07	4.26	5.79
August	3.65	2.15	7.96	4.75	4.63	6.90

Chart I. Hydrographs for Seven Principal Rivers of the United States, August, 1907.

Chart II. Tracks of Centers of High Areas, August, 1907.

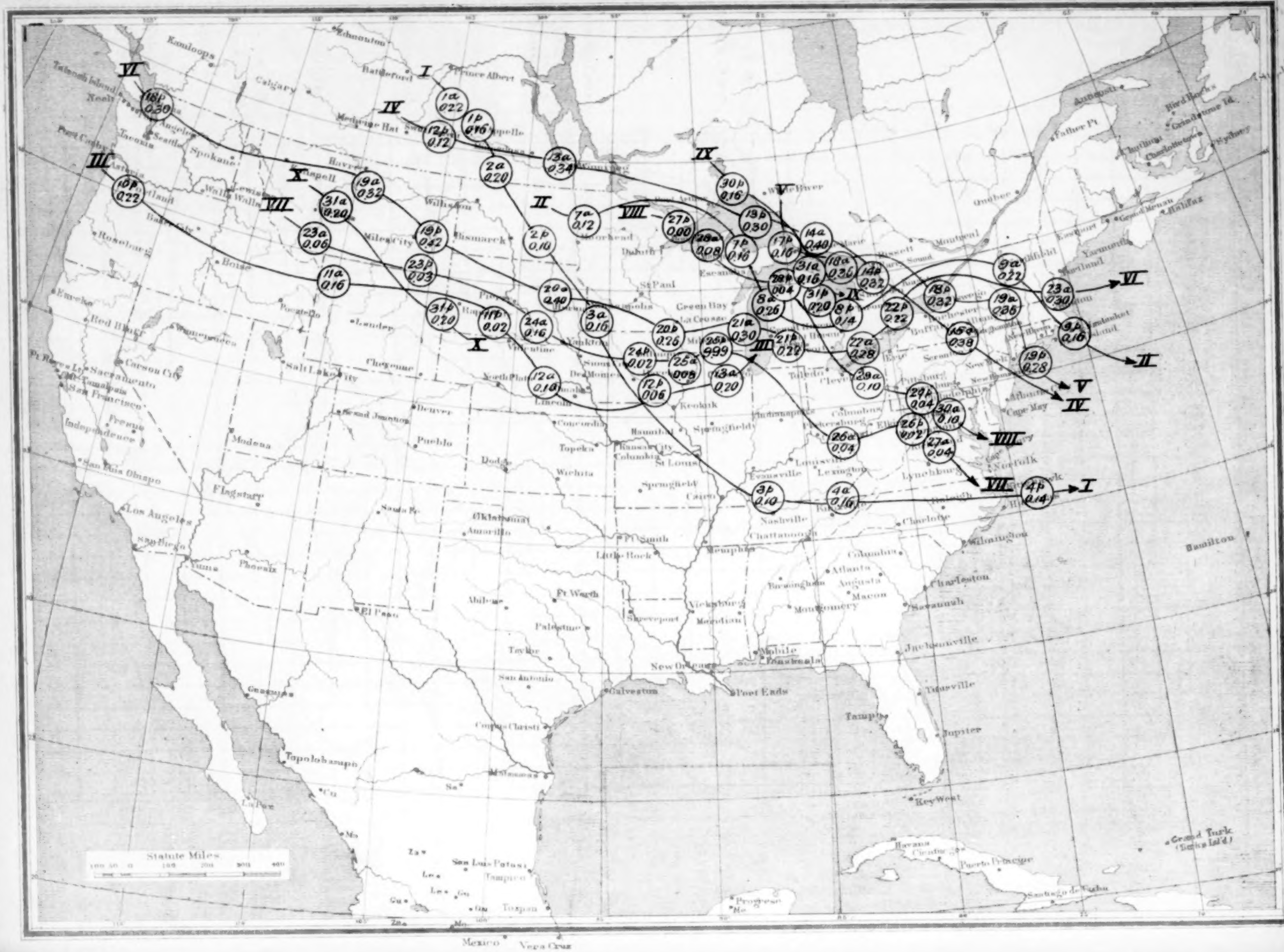


Chart III. Tracks of Centers of Low Areas, August, 1907.

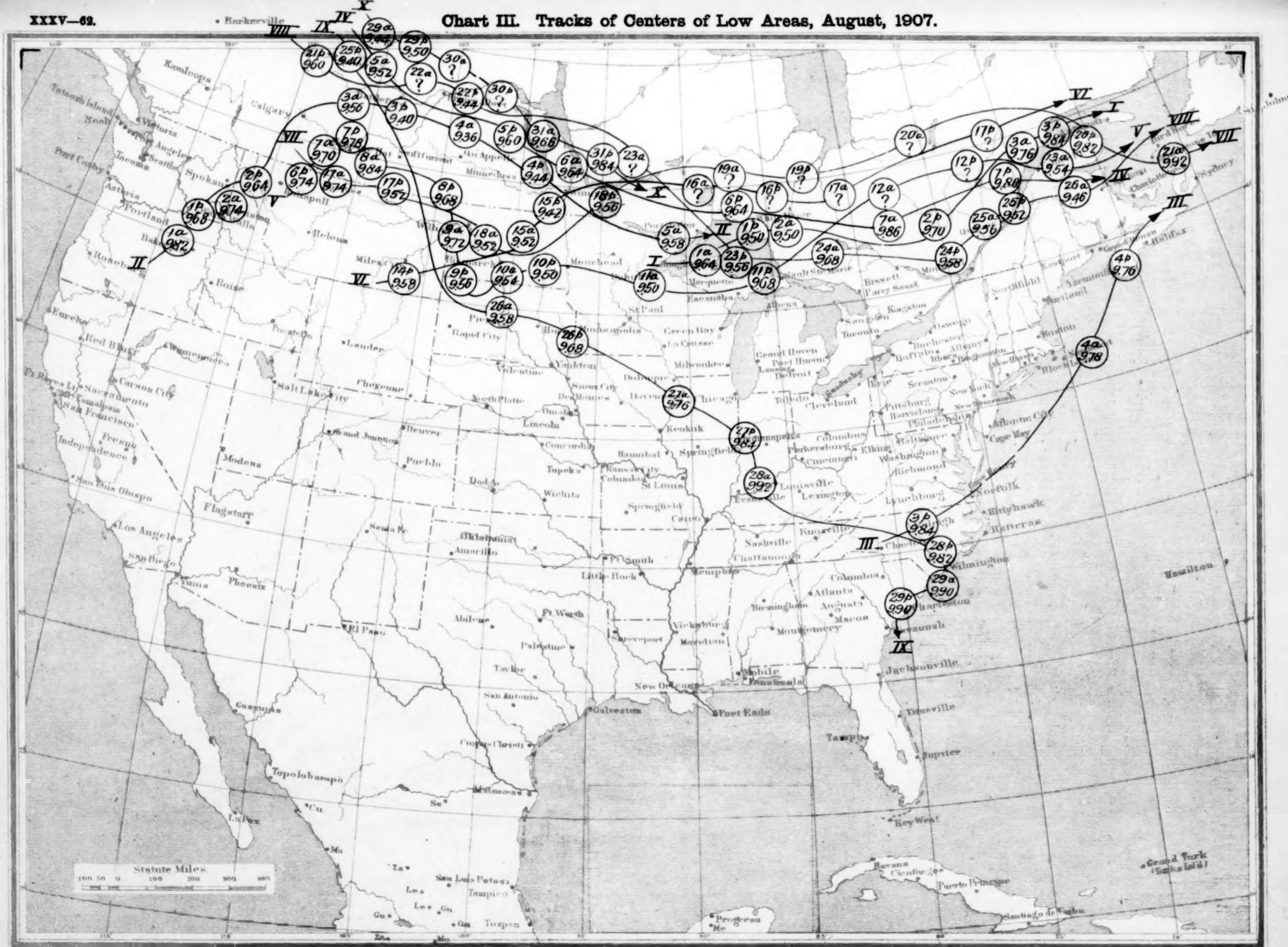
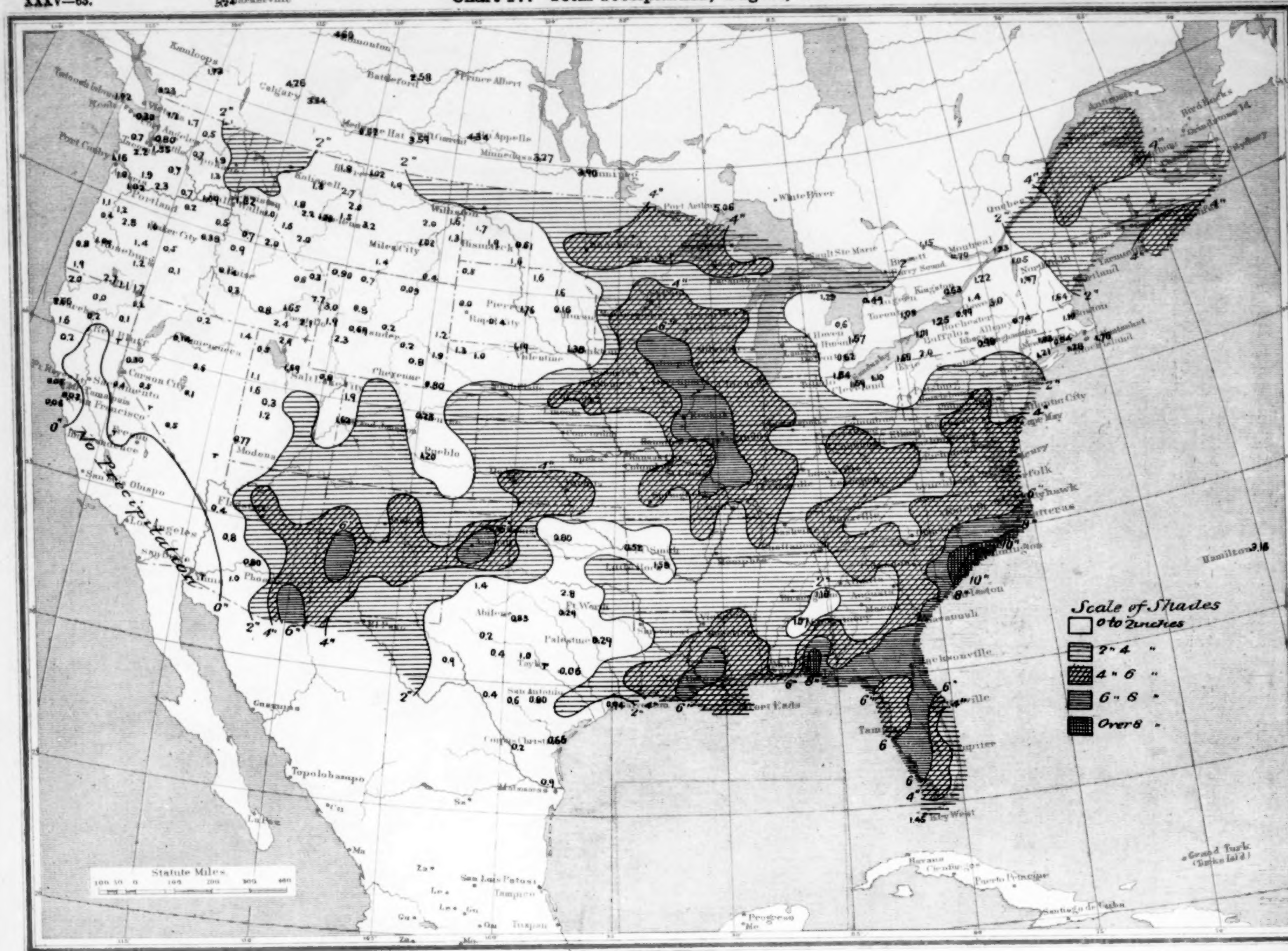


Chart IV. Total Precipitation, August, 1907.



XXXV—64. Chart V. Percentage of Clear Sky between Sunrise and Sunset, August, 1907.

Chart V. Percentage of Clear Sky between Sunrise and Sunset, August, 1907.

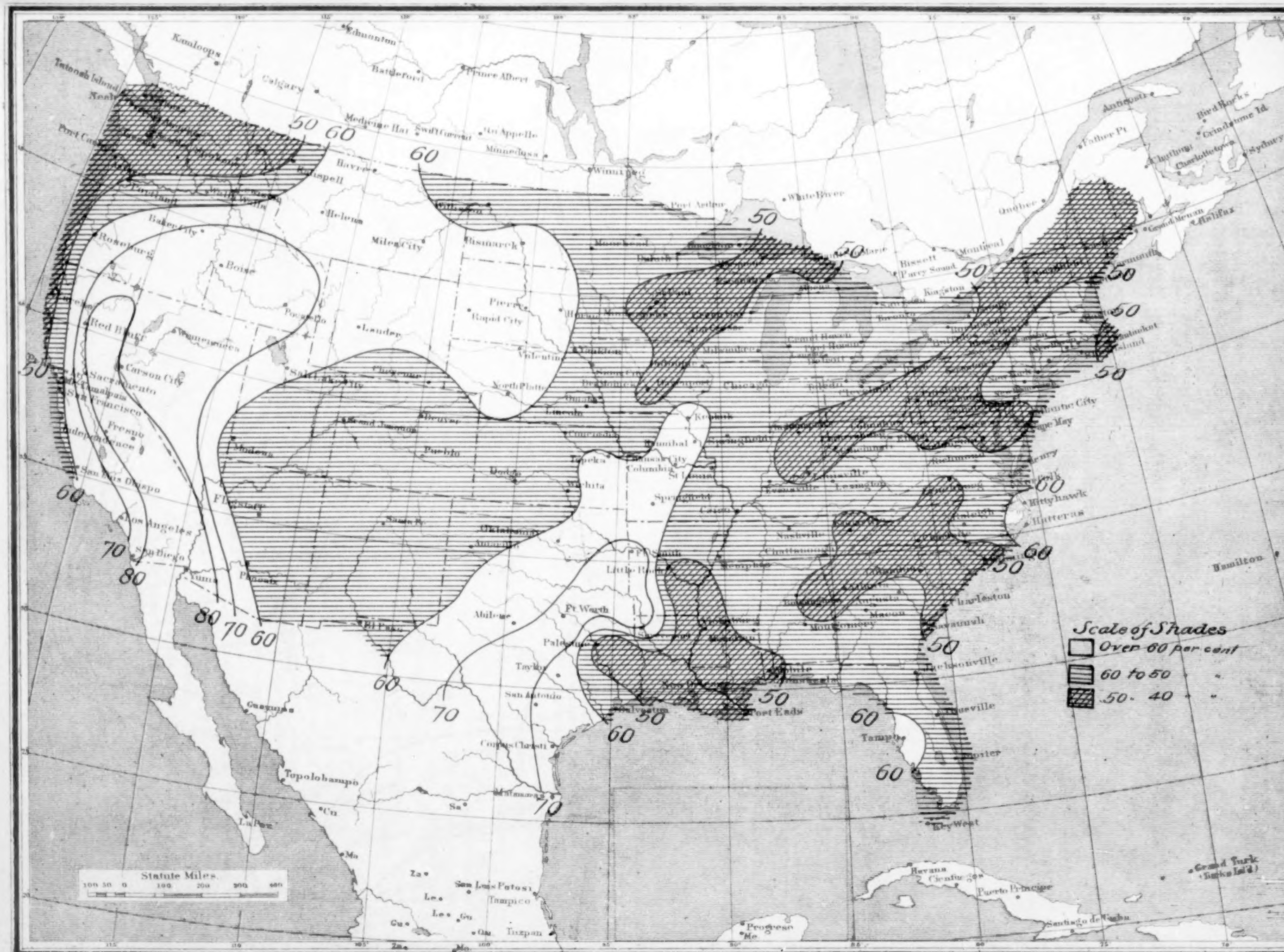


Chart VI. Isobars and Isotherms at Sea Level; Surface Wind Resultants, August, 1907.